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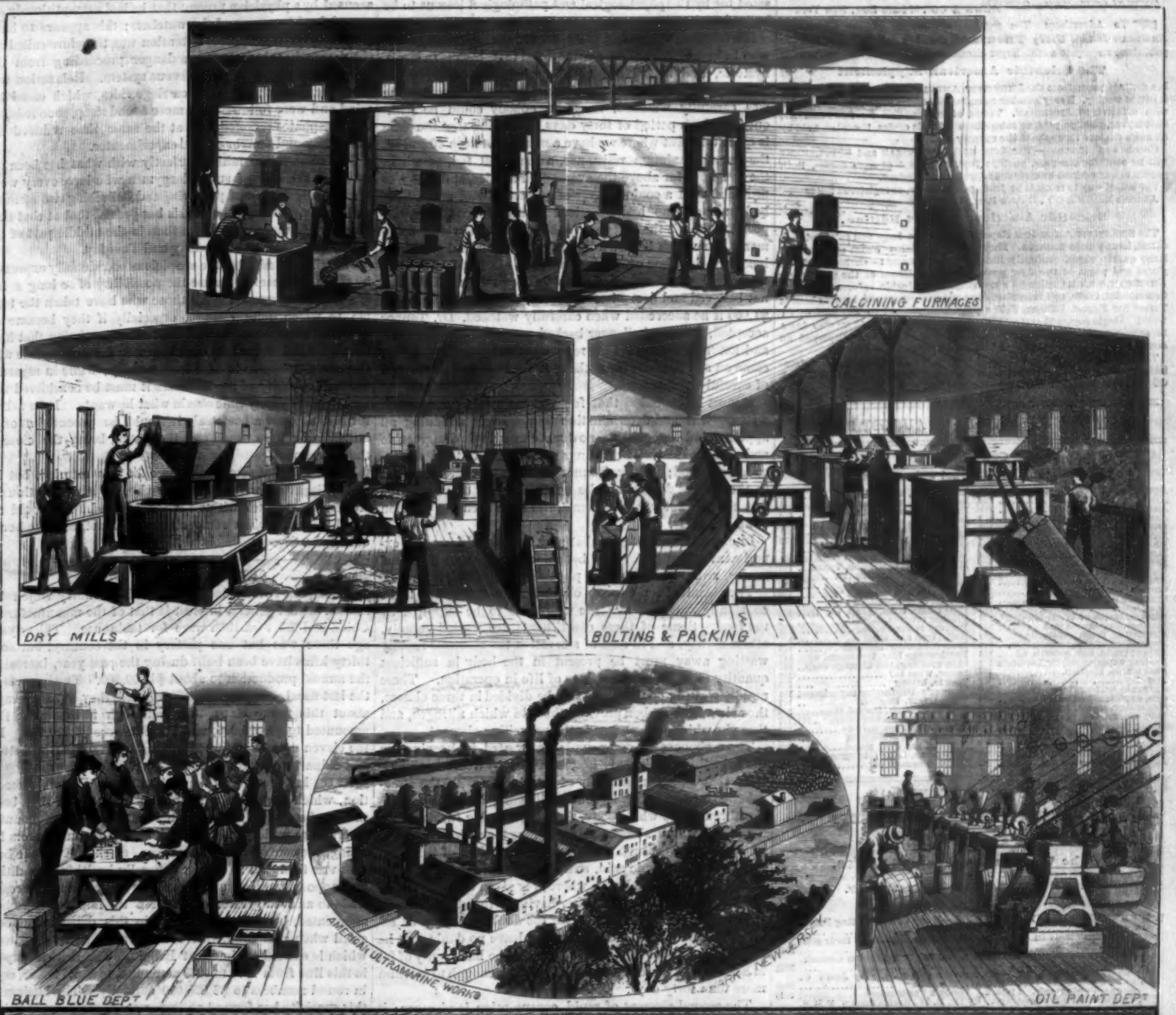

THE MANUFACTURE OF ULTRAMARINE.—AMERICAN ULTRAMARINE WORKS NEWARK, N. J.—[See page 117.]

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NEW YORK, SATURDAY, AUGUST 21, 1880.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 242,

For the Week ending August 21, 1880.

Price 10 cents. For sale by all newsdealers.

DR. TANNER'S FASTING EXPERIMENT.

Of all the exhibitions which have attracted the attention of the people in and around New York city, the forty days' fast of Dr. Tanner is not the least remarkable. If his aim was to draw public attention and be extensively noticed, he has fully attained it, as no daily paper can be taken up which does not contain a full account of his doings and feelings of the last twenty-four hours, while he is watched by the physicians of the allopathic as well as of the eclectic school, and in addition to this always by a *Herald* reporter, to make sure that there is no deception practiced, as has been so frequently the case with other pretended fasters.

That his experiment is not altogether useless, as is maintained by some, we will try to elucidate, notwithstanding we agree that the sacrifice and danger he exposes himself to appears so great that it is doubtful if they will be compensated for by the physiological and pathological lessons to be learned by it.

His fast has, in the first place, proved the mistake of those who judged all men alike, and reasoned that, because a weak, hysteric, and ill fed girl of 18, perhaps consumptive besides, died within two weeks from starvation, as soon as she was carefully watched, therefore nobody could be without food for a period of forty days, forgetting that the case is quite different where we have a man of between 40 and 50, the age of maximum resistance, a man well fed, of whom the weight is far above the average for his size, and who was provided with a copious layer of adipose tissue around his body, a man who had practiced fasting for sanitary purposes, finding it the best way for him to cure gastric derangements, for which he had a liability, and who had gradually increased the time of fasting until, at his last fast in Minneapolis, he had extended it to forty-two days. This was not believed and deception suspected, hence a challenge for $1,000 if he succeeded when carefully watched. Dr. Tanner accepted, but the challenger backed out under some pretext, and Dr. Tanner, to save his reputation and prove his theory, came on and submits for nothing to the task under the eye of careful watchers.

It must be conceded that few persons would possess such a strong will and determination to persist in subduing all appetite, and disregard the no doubt exceedingly disagreeable and perhaps distressing feelings consequent to total abstinence from food; but Dr. Tanner possesses this determination in the highest degree, and he never thought of cutting the fast short, whatever may sometimes have been the opinion of his watchers.

In order to understand what may be learned from this experiment we will, for the benefit of the non-professional reader, remind him of a few physiological principles.

The chemical constituents of the human body have to be constantly renewed, and the waste has to be supplied by the food. Some of these constituents are wasted rapidly, others slowly, and in case of starvation the elements rapidly wasting away must be present in the body in sufficient quantity to keep the functions of life in operation. These rapidly wasting constituents may be divided in three classes, those in which carbon prevails, those in which nitrogen, and those in which phosphorus is the prevailing element.

The carbonaceous compounds are wasted in keeping up the animal heat. This is accomplished by a slow combustion, that is, a combination of the carbon with the atmospheric oxygen, which is continually going on in the capillaries through the whole body, the oxygen being furnished by the blood, which absorbs it in the lungs, and which by the arteries is sent through the body. The product of this combustion, the carbonic acid, still absorbed in the blood, is by the veins sent to the lungs, where it is given off and escapes in the act of respiration. After having stripped Dr. Tanner, when he commenced his fast, for the double purpose of ascertaining his physical condition and leave no doubt that he had no food about him, it was seen that he had plenty of fat in and around his body to furnish carbon enough to last him more than forty days.

The second element of rapid consumption is nitrogen; it proceeds from the waste of the muscular tissue, which is always going on, even during sleep, as the heart is a muscle continually contracting, and respiration is kept up by muscular action. The blood takes up this waste in the form of a compound, of which the chemical name is cyanate of ammonia, but which by physiologists is called urea. It is the function of the kidneys to secrete this from the blood, and numerous experiments have settled the nature and amount of this secretion, which in healthy persons consuming food varies from 25 to 35 grammes every twenty-four hours. When Dr. Tanner began his fast it was secreted at the rate of 29 grammes, and as the nitrogen in any excess of nutrition is similarly changed and secreted, it was expected that a large reduction would be observed as soon as the fast began to have effect on the system. This expectation was realized, and the amount soon fell off to 23, 21, 17, 16, and finally 13 grammes, at which it remained stationary, with slight oscillations beyond. This amount of nitrogenous substance represents, therefore, the waste necessary to sustain the functions of life, and would at once be increased in case food was taken by the experimenter, at least nitrogenized food, such as beef extract or its equivalent, albumen, casein, milk, etc., the only substances which would be of benefit to him. Analytical chemistry, therefore, acts here as a reliable detective, and to the credit of all concerned it must be said that never the least suspicious increase of urea was observed, it remaining very nearly constant, and will no doubt become double and more as soon as after the fast food is again taken.

The third element of rapid waste is the phosphorus; it proceeds chiefly from the waste of the brain and nervous tissues. It is so important in these functions that a great German chemist has formulated the expression, "without phosphorus, no thought." Every mental act and every nervous excitement is accomplished by a consumption of phosphorus, which, combined with different bases in the body, especially soda, magnesia, and lime, is secreted by the kidneys as a soluble salt, not only easily detected as crystals by the microscope in the sediment, but even an approximate estimate may be had of its reduction or increase by the number of crystals seen in the field under the same circumstances.

This third element did not at first show any reduction in quantity, but, to the contrary, for a few days some increase. It was at the occasion that Dr. Tanner had been unjustly accused by a physician present that he had surreptitiously accepted food from one of the watchers; this appears to have preyed upon his mind. Attention was therefore called to the danger in this direction, a danger proceeding from the more rapid waste of the nervous system. Relaxation was therefore devised, and daily carriage rides, which eased his mind and were followed by a more sound sleep, soon reduced the phosphates secreted, and at the same time reduced the irritability and temper of the experimenter.

This observation tallies perfectly with what has been observed in the case of such clergymen who have every week the periodical labor of preparing and delivering two sermons on Sunday. Chemical analysis has proved that at that time they secrete more phosphates than in the middle part of the week, after the rest of Monday and Tuesday.

We will only add that the suspicions occasionally expressed by those who cannot realize the possibility of so long a fast are utterly unfounded. All those who have taken the trouble to watch long enough, especially if they became acquainted with Dr. Tanner, came to the conviction that he is too high minded, upright, and honest to deceive any one with so mean a device as to take food secretly; while in regard to the responsibility of the watchers it must be considered that Dr. Tanner can any time obtain what he wants. If he asked, for instance, for a beefsteak it would be procured at once, but this of course would end the watch, being the close of the experiment.

He told us that some years ago he was married, but became disgusted with his wife, who, he says, continually stuffed her stomach with all kinds of food. He could not stand this, and when remonstrance did not improve her he obtained a divorce.

OUR POTTERY INDUSTRY.

Among the special industries of the country which but seldom attract general interest is that of the manufacture of China and other earthen ware for table use. Thirty years ago there was but one pottery in the country, but some thirty kilns have been built during the past year, increasing the annual production to about $4,000,000. The imports for the last fiscal year were $4,082,787, and they have averaged about this figure since 1873, although in that year they amounted to $6,015,925, and in 1872 were $5,270,785. For the eleven months to June last the imports of earthen, stone, and china ware, were valued at $5,101,504.

At the last meeting of the United States Potters' Association, which was the sixth annual convention of that body, the members were congratulated that "American manufacturers were rapidly gaining, and foreign manufacturers fast losing, the control of the American market." As the business was then said to be in a generally healthful condition, we suppose manufacturers here have shared in the increased trade to an even greater extent than the imports have been augmented, but still our business in this department seems small when compared with the extensive pottery industry which is carried on in Great Britain. The British exports in this line from 1860 to 1879 amounted to £17,748,028, equal in round numbers to $8,850,000 annually. The business in this specialty has formed an important department in British manufactures since Josias Wedgwood, in 1763, made some of the most valuable improvements in the art, and from that time the reputation of the Staffordshire potteries has been worldwide. With the excellent supplies of crude materials we have, however, the aid of a very considerable duty, and constant accessions to our labor supply from the immigration of skilled English workers, it would seem that this industry should continue to meet with a healthful development here until its productions are at least sufficient for the supply of the home market.

In a report of the committee on raw materials of the Potters' Association, it was suggested that funds be appropriated for making analyses of the different clays, feldspar, and quartz found in various parts of the United States, so that each member might have the results of an authoritative examination, instead of being dependent, as at present, upon their individual experiments, which were described as "crude, costly, and empirical." The ordinary methods of testing clays employed by potters were said to be very imperfect; "one clay is unctuous, another refractory; one dries hard, another crumbles; one burns pure white, another yellow; one is short, another tough," etc., few if any of the members knowing the real causes of such differences. The same difficulties were said to exist in relation to spars and quartz, which were ground without an exact knowledge of their nature, and mixed with many foreign substances and impurities. The want of proper care and system in opening and working clay pits was also the subject of considerable

criticism, as this made it difficult for the potter to obtain just the kind or grade of clay he needed, the different qualities frequently being mixed, so that there was no uniform standard. To remedy this it was said that clay miners must work their beds on a broader scale, so as to obtain a more even grade, as, even in the best strata, there were variations every few feet, and, by working in a small way, it was impossible to prevent the mixing of the different qualities.

The interesting archæological discoveries of Dr. Schliemann and General Di Cesnola have, of late years, drawn more particular attention to ancient accomplishments in the ceramic art, but, while so much interest is being developed in the purely artistic side of the question, we hope the practical department—that which tends to develop and enlarge an important home industry—will not be lost sight of.

ANOTHER RAIN CONTROLLER.

Several schemes for the artificial production of rain have been noticed in recent issues of the SCIENTIFIC AMERICAN. Mr. Geo. H. Bell, of this city, goes further, and sends us the plan of a rain tower, by which he would not merely produce rain when it is needed, but prevent rain when nature is disposed to grant that blessing too liberally.

Mr. Bell's rain tower is a charming little structure of stone, one hundred feet in diameter at the base, and tapering to sixty feet diameter at a height of one thousand feet. Above this rises a tubular tower of wood or iron, say five hundred feet. It would not often be necessary to go above one thousand five hundred feet, Mr. Bell thinks, though that altitude might be exceeded if necessary. Of course there would be no risk of such a tower being blown down or crushing its foundation by its own weight.

The interior hollow of the tower would have a diameter of twenty feet; and through it a vast volume of saturated air could be blown into the upper atmosphere by means of proper machinery at the base of the tower. In case that might not suffice to secure the desired precipitation of rain, an additional up-rush of air around the tower is obtained by means of numerous tubes leading upward and outward from the interior of the tower at an angle, say, of 45°. Similar tubes descending from the inside to the outside of the tower serve as inlets, the air let in through them being sucked in by the ascending current within the tower; then, after it has received "the upward impetus of the inside force," it will be ejected upward through the ascending tubes. "Thus," in the words of the inventor, "through every stratum of air pierced by this mammoth rotunda, the air surrounding the outside walls will be agitated by an upward influence," making the exterior ascension indefinitely exceed the interior.

The inventor adds: "While these tubes, discreetly located at meteorological centers, would doubtless become reliable agencies for the formation of clouds, it should be their faculty also to prevent rain; for by reversing the motion of the fan or blower, a descensional flow of air would begin, which might annihilate the clouds overhanging, by bringing them to earth in aeriform and holding them here [securely bottled of course!] until they be wanted in precipitation on some locality, then instituting the ascensional flow and send them up to be condensed."

Mr. Bell suggests that a single timely rain would pay the cost of building a tower of this sort, "and a nation furnished with a reasonable number might prove them her wealth and grandeur."

REMARKABLE EXPLOSIONS OF GAS.

An explosion of gas of a magnitude unprecedented in the history of gas illumination, occurred in London, July 5. The district in which the disaster happened had been supplied with gas through a system of small (three and four inch) mains, which had become inadequate. Accordingly preparation had been made to increase the supply by laying down a new thirty-six inch trunk main. This work had nearly been completed, only a single length of pipe having to be put down before the gas could be turned in. The point of junction was in an open trench, where the end of the main had been plugged and fitted with a half inch stand pipe.

Just before the explosion workmen had been engaged in cutting out the plug from the end of the pipe. The foreman was standing on the main near the stand pipe, from which he had removed the pressure gauge with which he had tested the main, and ascertained that there was no pressure in it. He then smelt the stand pipe to ascertain whether any gas was issuing therefrom, and finding none came out, he applied a light, and almost immediately a dull rumbling sound was heard, followed by an explosion, which blew one of the workmen a considerable distance into the open pipe on the opposite side of the trench, killing him instantly, and so injuring the other man that he died shortly after his removal to the hospital. The foreman escaped unhurt. There was a quantity of dust and smoke, but no flame was seen.

Almost simultaneously another explosion occurred some yards away, and was followed by five or six more explosions at varying distances along the line of the main. The streets were much torn up, many buildings were wrecked or more or less seriously injured, and several persons were hurt. At the second point of explosion something like a dozen lengths of main were upheaved; at others, from three to six lengths were blown out; while in two places the explosion was limited to one length. At each point of explosion the paving stones were hurled into the air, causing great destruction of surrounding property, and peril and injury to passers-by.

At the coroner's inquest, the foreman of the pipe layers testified that the point of first explosion was nearly two miles from the "live" main containing gas. The new main —technically "dead" main—was shut off from the live main by means of a valve and cap, the cap being bolted on so that there was no flow of gas from the live main to the dead one. Everything was ready, however, to turn the gas into the new main when the lacking length at the west end had been laid. How the gas got into the main which was broken up is a mystery. In his testimony, the chief inspector of the gas company said:

"I was certainly not aware of there being gas in the main; but it did not occur to me to test it. I did not think gas had come there. The valve in Howland street was put in under my superintendence, and I know that it was sound and proper. I have no doubt that the explosion was caused through there being gas in the main to the westward. About five per cent of gas combined with atmospheric air would be sufficient to create an explosive mixture, but ten per cent would be more dangerous. The main had not been tested with a view to seeing whether gas was present. It is my belief that gas had got mixed with the air in the main, but I cannot account for it. The theory I have formed is that gas must have escaped from a fracture in one of the smaller pipes, and found its way into the main."

Another theory was that the passage of some heavy vehicle over the valve in Howland street might have loosened it enough to let a sufficient quantity of gas into the "dead" main to make the mixture of gas and air explosive. The explosion not only tore up the streets in places, but broke in the sewers, and so damaged the gas and water connections of the houses as to leave the district for some hours without water or light.

Though this accident was pronounced unprecedented by gas engineers, it was quickly followed by a similar but fortunately less disastrous one of the same sort. A number of workmen were engaged in enlarging a gas main at Bilston, near Wolverhampton, England, when, through an incautious use of a light, an explosion occurred, and a portion of the roadway and pavement was upheaved. The explosion traveled underground, and burst at some distance from its origin. The amount of damage done, however, was not great, and no lives were lost. A second explosion occurred some hours after the first.

THE TEXAS HYDRAULIC MINERAL BELT.

A correspondent, writing from Round Rock, Texas, announces the recent discovery of a valuable and very extensive deposit of hydraulic earth, which crops out along a belt many miles in length. At Del Valle, on the Colorado River, eight or ten miles from Austin, it shows a stratum from sixty to eighty feet thick, above the river. At Round Rock, twenty miles northeast of Austin, it lies two feet below the surface, and is of unknown depth. At this point it is easily converted into quicklime by burning. Mixed with from two to four parts of sand it produces a hydraulic building mortar or artificial stone, said to be equal to that made with the best English Portland cement. By similar treatment with three parts fine sand through one-eighth mesh sieve, and three parts coarse gravel through one-fourth sieve, it produces a concrete which, when moulded and pressed, gives a hydraulic stone brick of superior quality, suitable for all common building uses. The presence of such an inexhaustible supply of material for making cheap and strong artificial stone cannot fail to be of great benefit to Texas.

ARSENIC IN WALL PAPERS.

A law suit concerning the use of arsenic in colors was lately tried in the High Court of Justice, London. Steinhoff, a color maker, sued Woollams & Co. for a small bill for colors furnished. Woollams refused to settle because the colors were found to contain arsenic; they not only refused to pay, but claimed damages against Steinhoff to the amount of nearly two thousand dollars. It was proven on the trial that Steinhoff, when he sold the colors, which were the "imitation azure blue," guaranteed that they contained no arsenic. Woollams showed that his reputation in business was to a great extent founded on the fact that his wall papers were made without arsenic. Believing that the colors of Steinhoff contained no arsenic, he made up a lot of wall papers therewith. Subsequently it was found that the colors contained arsenic to the large extent of fifty per cent. The jury allowed the claim for damages. So the plaintiff, instead of obtaining a judgment in his favor, had a heavy judgment rendered against him, and had to pay the costs on both sides in addition.

THE MAGNET IN MEDICINE.

Some recent researches undertaken under the direction of Prof. Charcot, in his laboratory at the Salpêtrière, have attracted attention anew to a therapeutical agent which has been known for a long time, but which at the present time has fallen into disuse. We refer to the application of the magnet in the treatment of certain diseases. It is claimed by the believers in the efficacy of this mode of treatment that magnetization has fallen into discredit on account of the absence of precise rules for the application of the remedy, and also because of the air of mystery which seems to be connected with it. To Prof. Maggiorani, it is said, is due the credit of calling attention again, in 1869, to the value of magnetic medication, and of endeavoring to establish it on a rational and strictly scientific basis. The first experiments were made at the Salpêtrière in order to verify the facts collected together by M. Burq under the generic title of metallotherapy. After the results obtained by metallic applications, it was natural to endeavor to throw some light on these phenomena by varying the conditions of experimentation. It was found that patients (especially those afflicted with nervous diseases) were not only acted upon by plates of different kinds of metals, but that like results were obtained by the majority of physical agents, such as weak currents, static electricity, sonorous vibrations, differences of temperature, magnetized bars, etc. It was soon found that magnetized bars were remarkable for the consistency of their action and the facility with which they could be employed. It is not claimed that magnets are endowed with specific properties, but that they form part of a group of physical agents which, in varying degrees, possess the same power as the above-named of affecting the nervous system and giving rise to biological phenomena. The Salpêtrière researches have provoked a lively discussion. The facts announced have been confirmed in Germany, Italy, England, etc., but have been boldly attacked likewise in the last-named country.

A medical writer in *La Nature*, who has been a witness of Prof. Charcot's experiments, says that the action of the magnet is in some respects so surprising that it might *a priori* excite mistrust. The application is not direct. The magnet is not placed in contact with the skin of the subject experimented on, but its action takes place at a distance. To influence the organism and to produce the same effects as with metals it only suffices to place the poles of the magnetized bar at one or two centimeters' distance from that portion of the body upon which it is desired to act. It is thus that all the experiments have been made at the Salpêtrière. It is not necessary that the magnet should be a large one, but merely that the magnetic force should be appreciable. It is alleged by the writer in question that this mode of treating disease should be ranked of equal value with other methods now in use, such as that of electricity, etc.

The Growth of our Export Trade.

During the year just closed both the value of the imports of merchandise into and the value of the exports of merchandise from the United States were larger than during any preceding year in the history of the country. According to the annual report of the Chief of the Bureau of Statistics, just issued, the value of the exports of merchandise during the year ended June 30, 1880, exceeded the value of the exports of merchandise during the preceding year about $125,000,000, or 18 per cent, and the value of the imports of merchandise during the year ended June 30, 1880, exceeded the value of such imports during the preceding year about $222,000,000, or 50 per cent. The increase of the value of imports of merchandise exceeded the increase in the value the exports nearly $97,000,000.

The value of the imports and exports of merchandise during the fiscal year just closed exceeded the value of such imports and exports during the preceding year about $347,000,000—an increase of 30 per cent. The rapid growth of the foreign commerce of the country is strikingly exhibited by the fact that the value of the imports and exports of merchandise during the fiscal year just closed amounted to $1,503,679,489, being about 81 per cent greater than the value of the imports and exports of 1870, and nearly 119 per cent greater than the value of the imports and exports for 1860.

The exports of coin and bullion during the year ended June 30, 1880, were about $7,800,000 less than during the preceding fiscal year, and the imports of coin and bullion during the year ended June 30, 1880, exceeded the imports during the preceding fiscal year about $72,700,000. During the year just closed, for the first time since 1861, the imports of coin and bullion exceeded the exports of the same.

Wanted—An Easy Place.

Rev. Henry Ward Beecher some time since received a letter from a young man, who recommended himself very highly as being honest, and closed with the request, "Get me an easy situation, that honesty may be rewarded." To which Mr. Beecher replied: "Don't be an editor, if you would be 'easy.' Do not try the law. Avoid school keeping. Keep out of the pulpit. Let alone all ships, stores, shops, and merchandise. Abhor politics. Keep away from lawyers. Don't practice medicine. Be not a farmer nor a mechanic; neither a soldier nor a sailor. Don't study. Don't think. Don't work. None of them are easy. O my honest friend, you are in a very hard world! I know of but one real 'easy' place in it. That is the grave."

Injurious Effects of the Buttonball.

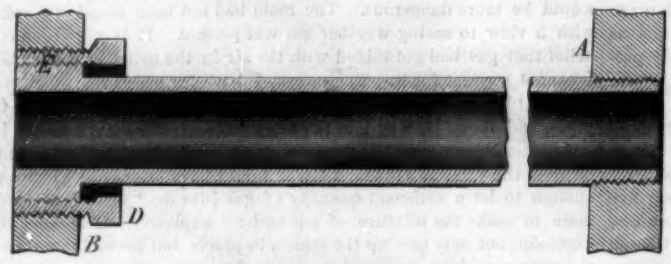
Les Mondes states that a French medical journal has recently called attention to the injurious effects that are apt to follow a residence near the common shade tree, the buttonball or plane tree. The fact has long been known, even from the time of Pliny, that a stay near these trees is often followed by an irritation of the air passages, followed by a disagreeable and sometimes persistent cough. This is due to the fact (familiar to botanists, though perhaps not to the general public) that the young shoots, leaves, and stipules are covered with a fine thick down composed of minute branched rigid hairs, which falls off as these parts become older, and often floats in the air in large quantities. It is the inhalation of this that causes the throat difficulties. It often causes serious annoyance to employes in nurseries where the tree is raised, and who fail to take precaution against it.

Lake Michigan White Fish.

For the past three years the catch of white fish in Lake Michigan has been small, owing, the fishermen say, to the prevalence of northeast winds. Recently the fish took a sudden departure from the southern end of the lake, abruptly cutting off the supply from the Chicago market. This unusual movement is attributed partly to an extraordinary influx of "sheepheads," but more to a sudden and remarkable change in the temperature of the water, from extreme cold lasting well into July, to a very high temperature for Lake Michigan. The white fish live principally upon worms and small shell-fish, and their chief enemy is the Mackinaw trout.

IMPROVED STEAM GENERATOR.

The steam generator shown in the accompanying engravings is of the class in which the water is contained in the interior of the tubes. Two horizontal tubes of large diameter serve the purpose of mud drums, and two similar tubes located at the top of the boiler form the steam and water drums. The mud drums and the water drums are connected by vertical or slightly inclined heating wrought iron lap-welded tubes, which are secured in the lower drums by simply screwing them in, in the usual way, but they are secured in the upper drums by means of a screw fitting, D, which is threaded both externally and internally, as shown in Fig. 2. The internal thread engages with the external thread on the end of the tube, and the external thread engages with the internal thread in the upper drum, B. To increase the size of the upper end of the tube sufficiently to permit of passing the felting, D, over the tube, and make a perfect connection, the end of the tube is enlarged either by welding a ring on the end of the tube or by swaging the tube at the end so as to increase the diameter. Mr. F. P. Franke has secured a patent for this method of connecting the tubes with the drums.



FRANKE'S STEAM GENERATOR.

In putting together one of these boilers a first and last heating tubes are put in place by first passing the enlarged end through the opening in the upper drum, then screwing the plain end into the lower drum. Then the fitting, D, is screwed over the tube and into the upper drum. It will be noticed that this boiler has no seams nor rivets.

This method of putting in the tubes has many advantages over right and left hand threads and other methods of making connections between tubes and drums, as it affords a ready means of introducing the tubes, and admits of readily removing any one of them without difficulty and without disturbing the others. The inventor informs us that ordinary wrought iron pipe is preferred for the tubes, as it is thicker than common boiler tubes and is stronger and more durable.

This boiler may be made of any height desired. It may be used for generating steam for power or heating purposes, and for hot water heating; and is now in successful use for all of these purposes, giving the highest satisfaction.

Any kind of fuel may be used with this boiler, and there is no possibility of the heating surfaces becoming covered with ashes or soot. It is very economical in the use of fuel, and is free from the danger of destructive explosion.

The heating surface being very large in proportion to the water contained in the boiler, steam may be raised quickly, and the circulation being good, steam is generated very freely. It may be shipped in sections and is readily set up.

Further information will be furnished by the manufacturers, Messrs. Renwick & Franke, 605 Main street, Buffalo, N.Y.

Novel Plating Process.

At a recent meeting of the Royal Dublin Society, says *The Ironmonger*, Dr. J. E. Reynolds gave some illustrations of a process he has discovered for coating metallic and other surfaces with a brilliant and strongly-adherent layer of galene. The plating of a tube of brass, and another of glass, was effected at the meeting by simple immersion in a solution which speedily deposited a beautiful mirror-like layer on the material. This layer readily assumed its final polish by friction with a wash leather, and it bore some severe treatment without giving way. The color of the deposit is darker than pure silver, but brighter than oxidized silver, and the coated surface can easily be made to assume a peculiar bluish bloom, which enhances its beauty. Dr. Reynolds exhibited a number of specimens in iron, steel, brass, glass, porcelain, ebonite, and other articles, which had been subjected to the action of the atmosphere for a period of more than two months in some instances, and all withstood this severe test completely without showing tarnish or rust. Dr. Reynolds mentioned that the cost of his galene plating process did not exceed one-eighth that of the nickel plating. Moreover, any intelligent workman could quickly become his own plater, as the use of electricity is altogether avoided.

MISCELLANEOUS INVENTIONS.

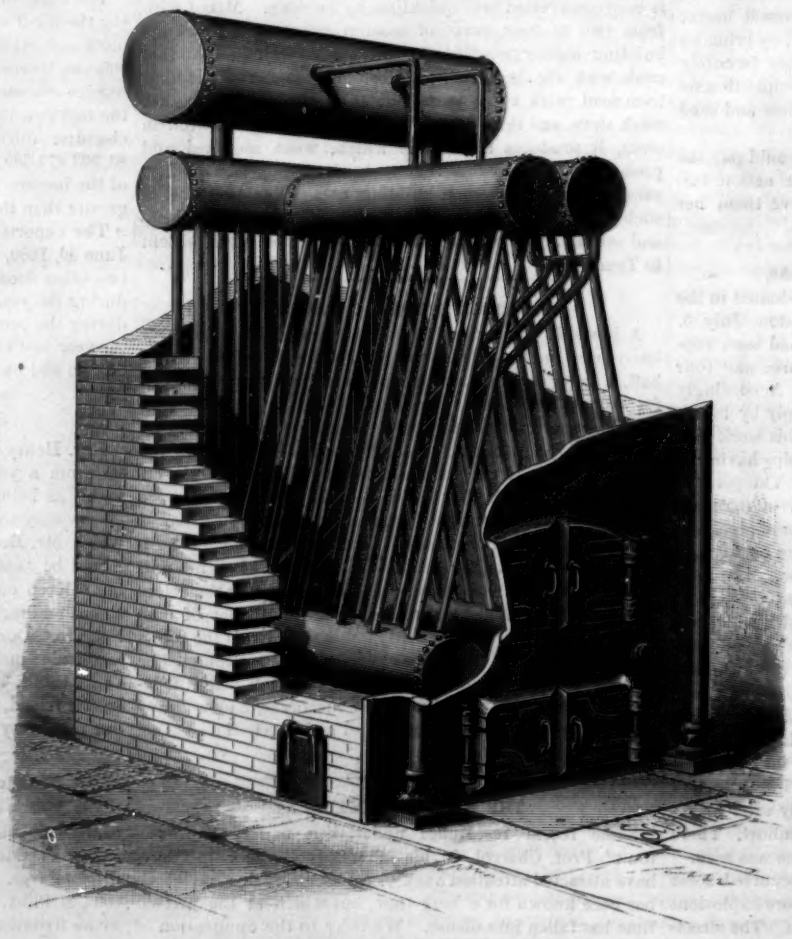
An improvement in mail bags has been patented by Messrs. Thomas O. Bennett and Samuel Trenbath, of Clifton, Mich. This invention consists in a hinged metallic frame attached to the mouth of the bag, and in a lock used in connection therewith, whereby provision is made for holding the mouth of the bag open when desired and for securely locking it when closed.

Mr. Charles S. Philips, of Brooklyn, N. Y., has patented an improved sweat house for curing tobacco, which is so constructed that the tobacco, while packed in cases, can be subjected to the vapor of water at any desired temperature, and thus moistened without being made wet. The invention consists in constructing a tobacco sweat house of a metal-lined tray, an interior wooden bottom, and steam pipes, and a double walled sweat house or chamber having a slotted or slat floor, an inclined roof, and upright cleats attached to the inner surface of its side walls.

Mr. William C. Thornton, of Castle Rock, Mo., has patented a device by means of which the weighing of canned fruit, vegetables, etc., can be conveniently and quickly effected.

Mr. John B. Clopton, of Elgin, Texas, has patented a mechanical telegraph sounder adapted for the use of learners for practicing the manipulation of a telegraph finger key. It consists in a sounder wherein a finger lever and sounding lever are combined together with a spring in such manner that the action is very delicate and sensitive, and produces a sharp clear sound without the use of a battery.

An improved fan has been patented by Mr. Max Rubin, of New York City. This invention relates to that class of fans in which the web is secured upon two hinged handles, and consists in connecting the handles by a double-jointed hinge, in recessing the handles to receive the folded web, in combining stiffening strips with the hinge pivots and the web, and in combining with the handles a catch for fastening the handles together when the fan is closed or open.



FRANKE'S STEAM GENERATOR.

Mr. Jacob C. McCarty, of Edray, W. V., has patented a compound for saturating charcoal, coke, or coal to be used as fuel, consisting of a solution of chloride of sodium, sulphate of iron, and nitrate of potash.

An improved music chart has been patented by Mr. James W. Chambers, of Baltimore, Md. The object of the invention is to have music on the piano and organ rendered in all its completeness and purity of harmony, etc., in whatever key the music is originally written, without the necessity of knowing how to read music as usually written.

Messrs. Eugene H. and George F. Conant, of Camden, N. Y., have patented an improved knockdown rocking chair, so constructed that it may be closed into compact shape for transportation and may be conveniently put together for use.

Mr. James H. Mackintosh, of Paterson, N. J., has patented an improved spindle and bolster for spinning frames, so constructed that the spindle can be driven at a greater velocity than is practicable with spindles constructed in the usual way, and which will allow the driving band to be put on without detaching the whirl or bolster.

In the plumbing arrangements of houses it is common to fit a pan or safe beneath the wash basins and water closets to catch water from leaks and overflows, and fit such safe with a pipe to the cellar for discharging the water. Such pipes have been trapped or sealed at their lower ends by a tank of water to prevent foul or damp air from ascending; but such seal requires attention to supply water, and it is not practicable to apply a metal valve, as the pipe is seldom used and the valve rusts to its seat or becomes otherwise fixed and useless. Mr. Thomas Clements, of Jersey City, N. J., fits such pipes with a trap or valve which prevents entrance of air without preventing escape of water at any time.

Mr. George Wagner, of Swanville, Pa., has patented a door intended for use in connection with a pen, stable, or other building in which swine, sheep, or other small animals are housed; and the object of the invention is to allow ingress or egress to the animals at proper times, and also to provide for readily removing the door when desired.

An improved bee-hive has been patented by Mr. William S. Blaisdell, of Randolph, Vt. The object of the invention is to keep the bees at a uniform temperature, supply fresh air without a draught, give convenient space for surplus honey frames, afford easy access to the bees, and protect their food.

Mr. William Ford, of Great Bend, Kan., has patented a novel device to be placed on the top of a stove or furnace for holding and burning hay; straw, corn stalks, weeds, etc. It consists of a sheet metal drum closed at the bottom by peculiarly constructed dampers, and having a small central hole in its top for the introduction of a rod or poker for the purpose of pushing down or compressing the contents of the burner.

Mr. Franklin W. Lamb, of Hydesville, Cal., has patented an improvement in that class of gates that are operated by a system of cords and pulleys, and the object is to enable the gate to be easily opened and closed, and to support it in all positions.

Mr. Francis N. Still, of Lake City, Ill., has patented an improved gate pivot which is simple and effective. It consists of a conical socket secured in the top of the gate post, and containing a ball supporting a conical stud of a hood-shaped disk, upon which disk the top longitudinal bar of a balanced swinging gate rests.

Mr. William H. Rogers, of Amherst, Nova Scotia, Canada, has patented a fishway so constructed that the fish will readily find the entrance, and it is capable of being used at all stages of water. The invention consists in constructing the fishway with inclined partitions having openings and flanges at their upper ends and with openings and slides at their sides; also, in constructing the fishway with its lower end connected with an opening in the lower part of the dam, and extending it up stream with a gradual rise.

An improved device for adjusting and fastening transom sashes, greenhouse sashes, and other window sashes, so constructed that the sashes may be opened and closed easily, however heavy they may be, and held securely in any desired position, has been patented by Mr. Justus H. R. Prall, of Elmira, N. Y.

A light portable folding table for paper-hangers' use, which may be readily carried in the hand, and which is of sufficient length and strength to accommodate the strip of paper and bucket of paste, has been patented by Mr. William Trilk, of La Crosse, Wis.

Mr. Louis Prince, of Jersey City Heights, N. J., has patented an improvement in the class of invalid beds having a permanently attached bowl or funnel.

ENGINEERING INVENTIONS.

Mr. James M. Thayer, of Randolph, Mass., has patented an improvement in elevators by which they will be stopped and prevented from falling should the hoisting apparatus break or in any manner become disarranged.

Mr. John H. Blake, of Batavia, N. Y., has patented a cheap rotary engine that consists of few parts and is economical in the consumption of steam. The invention consists of an adjustable abutment, and a spring and crank shaft for effecting the movement of the abutment, and a rotary valve of simple construction.

An improved pile driver has been patented by Mr. Joseph W. Putnam, of New Orleans, La. This invention relates to an improvement in the class of pile drivers which are adapted for use in the construction of railroads, being for that purpose mounted on a truck or platform car in such manner as to admit of lateral movement in the arc of a circle, so as to drive several piles successively without requiring any change in the position of the truck or car.

Dika Bread.

The following interesting note concerning the preparation of the dika or odika bread of Western Africa has recently been received from Dr. H. W. Bachelor, in the Gaboon, by Mr. Thomas Christy, to whom we are indebted for it:

"The plums are gathered as they fall from the tree, and are emptied from the baskets one after another until a large heap is formed. They are allowed to remain many days until the outside has putrefied, and then the nuts are cracked, the seeds or kernels taken out and smoked for many days. Then they are put into a large mortar and crushed into a homogeneous mass. The rays of the sun are now allowed to pour on the mass, which melts and is put into a mould. This mould is of the shape of a frustum of a cone, and the cakes vary in diameter from eight inches to a foot at the base. These will keep for six months."

Dr. Bachelor also makes the following interesting remarks with regard to the native medicinal plants of the country:

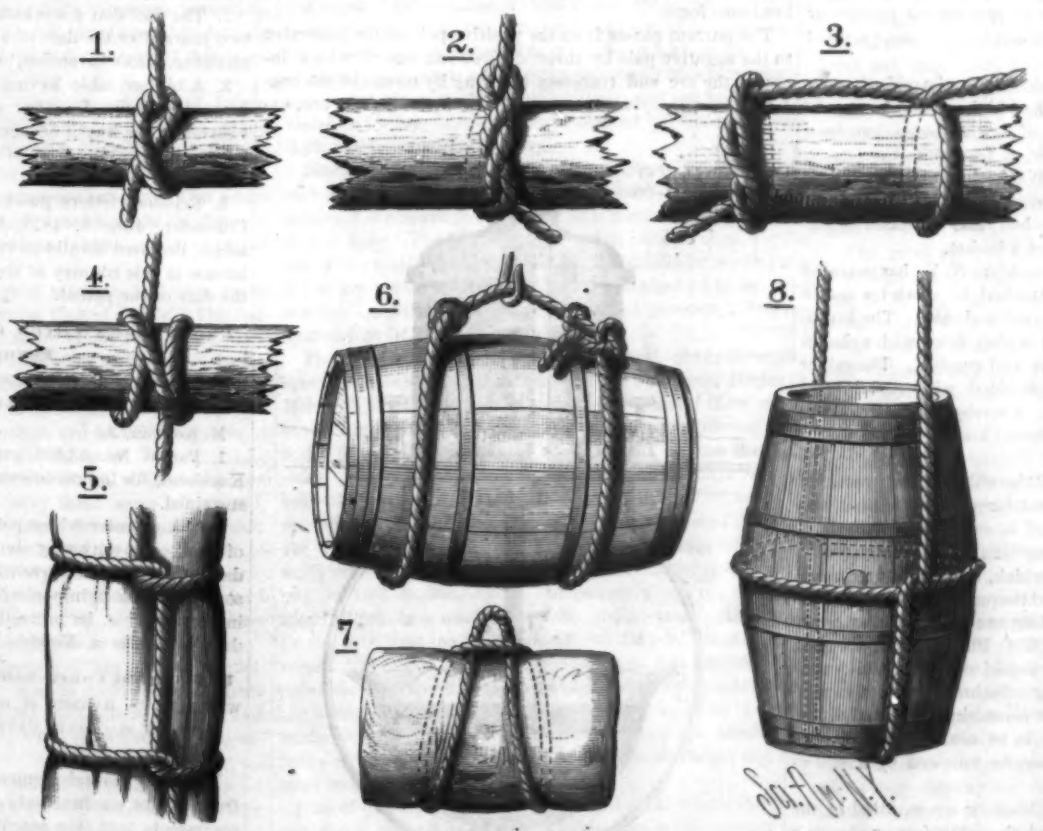
"The only way of ascertaining the properties of any product here is to ask the natives 'if it poisons goats,' or 'if the monkeys eat it,' and by direct experiment. The natives themselves know nothing of one medicine for one disease, and another for another. It is, in their opinion, the *witchcraft* that cures, not the leaf itself."

LIFTING TACKLE.

Every engineer, builder, and millwright knows the great importance that is attached to lifting heavy weights and fixing materials and machinery. It is no use for work to be properly finished if accidents happen in fixing. The young and inexperienced erector is frequently at a loss to know how and where to attach his ropes and other appliances to secure the best result, and, worst of all, no effort is made to teach him; he must rely entirely on his own observations. So well known is this ignorance with respect to lifting and hoisting in mechanical trades, that it is frequently stated, and often acted upon, that an old sailor makes the best erector. He is as nimble as a monkey on a pole or scaffold. We know very well that in our younger days we experienced considerable difficulty in obtaining information respecting knots, loops, and other rope fastenings.

No doubt all who have to do with the moving of machinery and other heavy masses will find the rope knots and fastenings shown in the engraving very useful. The information is not only useful when away from home in foreign countries, or away from the workshop, but it is useful *in* the workshop. The man who understands the use of rope tackle is a king among his fellows.

We have often thought that in these days of steam cranes and hydraulic jacks, men are not so ready in resources as they were many years ago. They trust too much to machinery and too little to themselves. They seem afraid to exert their real strength at the end of a rope. If we can only induce a few of our readers to study the art of lifting weights and encourage confidence in manual strength, we shall not consider our efforts to have been in vain. The various kinds of knots and loops are shown in the annexed engravings.



LIFTING TACKLE.

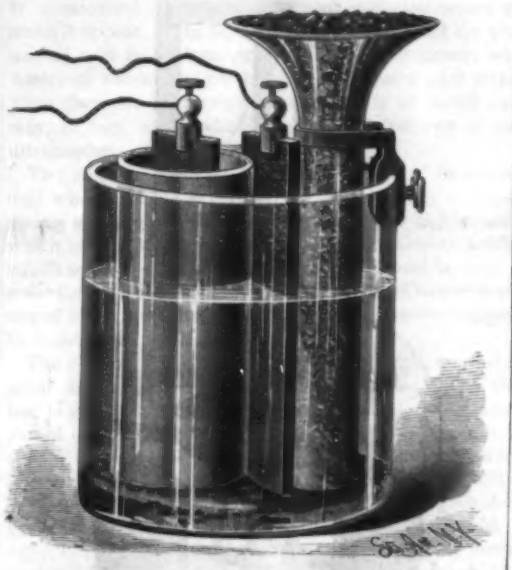
Figs. 1, Half Hitch. 2, Timber Hitch. 3, Half Hitch and Timber Hitch. 4, Clove Hitch. 5, Hammock Hitch. 6, Cask Sling. 7, Bale. 8, Butt Sling on End.

The Fastest Time in a Trotting Match.

On the closing day of the Jockey Club meeting, in Chicago, July 24, the best time ever recorded in an actual trotting match was made by the chestnut mare Maud S., owned by William H. Vanderbilt. The time was 2 m. 18½ sec. for the mile. Rarus has trotted in exhibition trials against time in 2:13¼ and 2:13½, and St. Julien in an exhibition trial in 2:12¾.

IMPROVED GALVANIC BATTERY.

In the battery shown in the engraving the ordinary zinc and carbon elements are employed, the zinc being placed in the porous cell and immersed in a solution of muriate of ammonia, and the carbon in oxalate of chromium and potash in combination with free bichromate of potash and muriatic acid.



ANDERSON'S GALVANIC BATTERY.

The negative portion of the cell may be charged in various ways, as for instance, by placing in the muriatic acid any oxalate, such as oxalate of copper or of ammonia, and adding bichromate of potash, whereby oxalate of chromium and potash is more or less quickly formed in the cell; but the mode the inventor has found advantageous to adopt is to add oxalic acid to a solution of bichromate of potash until effervescence ceases, and then to slowly evaporate the solution, whereby crystals of the oxalate of chromium and potash will be obtained. A sufficient quantity of this salt is then placed in the bottom of the carbon cell, together with about an equal quantity of crystals of bichromate of potash and muriatic acid, either pure or more or less diluted with water, according to the strength of the solution required, and the carbon is then placed in this solution. Instead of dropping the crystals or other agents loosely into the cell containing the negative solution, as has been generally the practice, the strength of the battery is regulated by inclosing the crystals of bichromate of potash in an adjustable glass tube, open at the top and having a bottom of perforated platinum or of platinum wire gauze, or the tube itself may be perforated either at the bottom or sides. This tube is immersed in the negative solution to a greater or less depth. The greater the depth of immersion of the tube the stronger the power of the battery, as more crystals are then exposed to the action of the solution. In this way, by adjusting the depth to which the tube is immersed the strength of the battery is regulated.

For a one-fluid battery the oxalate of chromium solution is common to both zinc and carbon. Arranged in this way the action of the battery, although of much shorter duration than when two fluids are used, the battery will be rendered much more intense, and the internal resistance of the cell will be less. The two-fluid form of battery is employed where great constancy, combined with a certain degree of power extending over a considerable period of time, is required, as, for instance, for telegraph work, the ringing of electric bells, and for the driving of electro-motors and the production of the electric light. On the other hand, the one-fluid form of battery may be used with advantage for purposes where a short, steady, and powerful action is required.

To prevent the escape of the fumes usually arising from the acids the solutions are covered with a film of oil or with a layer of finely powdered charcoal.

This battery was recently patented in the United States by Mr. Robert C. Anderson, of Woodgreen, England.

NEW INVENTIONS.

Messrs. Jacob Hollinger and John Flinner, of Millersburg, O., have patented improvements in that form of gate which, instead of swinging horizontally on hinges, is fixed upon a horizontal pivot bolt at one end between two posts, and is connected with rods and levers, whereby the gate is turned vertically over on its end when it is to be opened.

Mr. George K. Shryock, of Johnstown, Pa., has patented a dinner bucket the cover of which is provided with a glass lined sauce holder, preferably made in cup-shaped sections, which are made removable.

Mr. John Clayton, of Brainerd, Minn., has patented an improvement in rolling colters, which has for its chief object the exclusion of dust and dirt from the friction surfaces, thereby preventing wear of the journals, so that the durability and efficiency of the colter, as a whole, are increased. The inventor also provides for taking up such frictional wear as is unavoidably incident to use, and for supplying lubricant to the friction surfaces.

Mr. Jacob Katzenberg, of New York city, has patented an improvement in the class of suspenders in which a cord is combined with shoulder straps by means of pulleys or sliding attachments, so as to allow the free movement of the button pieces, and thereby accommodate the movements of the body of the wearer.

Mr. Thomas Ragan, of Philadelphia, Pa., has patented a non-freezing hydrant that can be disconnected from the water main and removed for repairs or other purpose without digging or excavating about it.

Mr. George Milbank, of Chillicothe, Mo., has patented an improved method of reducing grain or other substances, consisting, essentially, in subjecting the material under treatment to the action of reducing disks and an air current simultaneously, the air current passing between the disks and conveying the reduced material in opposition to the centrifugal action.

A metallic awning, so constructed that it may be folded compactly against the front of buildings and readily extended, has been patented by Mr. Wm. P. Woodruff, of New York city. The invention consists in a set of overlapped top strips, sets of overlapped end strips, and connecting and suspending chains and rod.

Messrs. Nicholas C. N. Laurense and Ernest G. Matzka, of Detroit, Mich., have patented a process of applying gilding or bronzing powders to mouldings, consisting, first, in mixing the gilding or bronzing powder with a solution of chloriae, alcohol, turpentine, diluted acetic acid, or any liquid compound with which the powder can be incorporated; in then adding thereto glue, isinglass, gelatine, or other soluble adhesive substance, and in then applying the mixture with a brush.

Mr. Henry Hartman, of Salt Lake City, Utah Ter., has patented an improved bridle, which is so constructed that horses can be easily and quickly controlled should they become frightened or attempt to practice ugly or dangerous tricks.

A novel device that may be attached to sewing machines for plaiting the fabrics to be sewed in plaits or folds of any desired width or any desired distance apart, has been patented by Mr. Leopold Lyon, of Hazleton, Pa.

An improved pianoforte attachment, by which the performer is enabled to sustain or permit the continuance of the sound of one or more strings after the fingers have been taken from the keys, has been patented by Mr. Carl Mahling, of New York city.

An improved safety whiffletree has been patented by Mr. Bolivar J. Quattlebaum, of Ridge, S. C. The object of this invention is to provide means for releasing horses from vehicles that may be instantly and conveniently operated in case of imminent danger, when it is desired to arrest at once the movement of the vehicle and the speed of the horse cannot be checked in time to avert the danger; and it may be used at any time for conveniently unhitching the horse from the vehicle by timid and unskilled persons, and at the same time provide against the accidental displacement of the trace from the end of the whiffletree.

Mr. William R. Parks, of Palmer, Mass., has patented a boiler which will heat water and make steam rapidly with a small amount of fuel.

An improved signal conveyer for hotels and other buildings has been patented by Mr. Joseph C. Beard, of Pine Bluff, Ark. The apparatus consists of a system of tubes leading from the different rooms to a common tube terminating at the office, and balls numbered to correspond with the numbers of the rooms, the messages being on the inside and being impelled by gravity. The pipe which conveys the balls descends continuously through the various rooms of the building to the office, and has an opening in each room. The box in which the balls are received contains a signal bell.

A self-closing faucet, that will close without spring or screw, has been patented by Mr. Thomas H. Walker, of Kansas City, Mo. The invention consists in a combination of devices that cannot be clearly described without engravings.

Mr. Elijah S. Caswell, of Taunton, Mass., has patented an improved shoe or boot nail, having the oblong head and a point beveled equally on both sides, and provided with lateral projections a short distance from the head.

A diagram for the use of draughtsmen in making perspective sketches or drawings, whereby such drawings may be made in true perspective and to scale in every part, has been patented by Mr. Emery M. Hamilton, of New York city. The invention consists in a diagram sheet having printed upon it guide lines in perspective and vertical and horizontal lines, the result of these combined lines being that the sheet is laid out in perspective scales, which can be utilized as guide lines for making a drawing at any angle to the horizon and vertical.

Mr. Charles F. Linscott, of Boston, Mass., has patented an improved glass plate cleaner, which consists of a head or holder and one or more rubber strips made thicker at one edge, with one side flat and the other side concaved from the thicker edge to, or nearly to, the thinner edge.

Mr. Edward Weissenborn, of Jersey City Heights, N. J., has patented an improved package for pencils, crayons, and similar articles, so constructed as to prevent the pencils or other articles contained in the packages from rubbing against each other.

An apparatus by means of which, with the aid of water and certain chemicals, the dry air of high altitudes may be made to resemble the moist air of low altitudes, has been patented by Mr. Henry R. Fowler, of Leadville, Col.

Mr. William F. Phillips, of Watford, Ontario, Canada, has patented a swing, having two pairs of crossed posts, strengthened by cross bars, a cap box, and branched swinging bars, from which is suspended a basket.

Mr. Edward J. McClellan, of Brooklyn, N. Y., has patented a device that may readily be attached to a pan for use in mixing and kneading dough for bread and cake. The invention consists in an adjustable bar or plate fitted with a clamping screw and carrying the mixer and gearing. The mixer consists of an arbor or staff provided with radial arms and fitted with eccentric gearing, whereby both a revolving motion and up-and-down movement may be given to the staff.

Mr. Alfred N. Gabel, Sr., of Ridgeville, Ill., has patented a fertilizer distributing attachment for planters for distributing fertilizers in hills or drills and in any desired quantity.

Mr. Benjamin J. Howe, of Sing Sing, N. Y., has patented an improved dish washer, by which, the inventor claims, as many dishes can be washed and thoroughly cleansed in five minutes as can be done by hand by one operator in an hour.

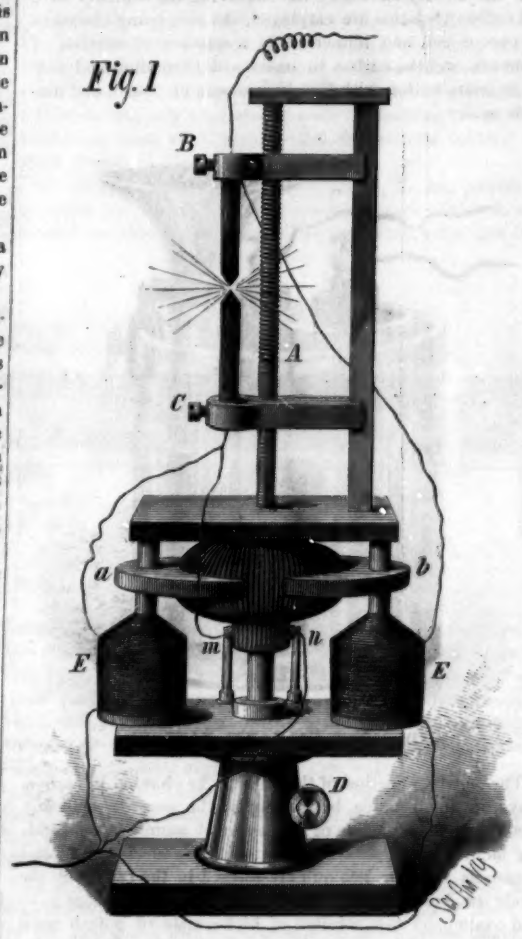
Mr. Thomas F. Longaker, of West Philadelphia, Pa., has patented an adjustable gauge for liquid measures, which consists in providing the measuring attachment with a device for adjusting the attachment for measuring liquids of different specific gravities, and also in so constructing the discharge valve that the packing may be renewed by unscrewing the valve seat.

The combination of a bench hook or screw, fitted in the table, with a swinging frame and clamping jaw or vise, has been patented by Mr. Nathan E. Lovejoy, of Columbus, O.

Mr. William N. Crabtree, of Porterville, Cal., has patented an improvement in hair trigger gun-locks, which consists in devices that will prevent accidental discharge of the gun without requiring additional manipulation or interfering with the rapid handling of the piece. A blocking piece is interposed between the hammer and breech, to prevent contact of the hammer with the cap tube, and a thumb lever fitted upon the hammer holds the blocking piece out of action when the hammer is set for firing. These devices work automatically by the usual manipulations of the hammer.

THE ELECTRIC LAMPS OF W. TCHIKOLEFF.

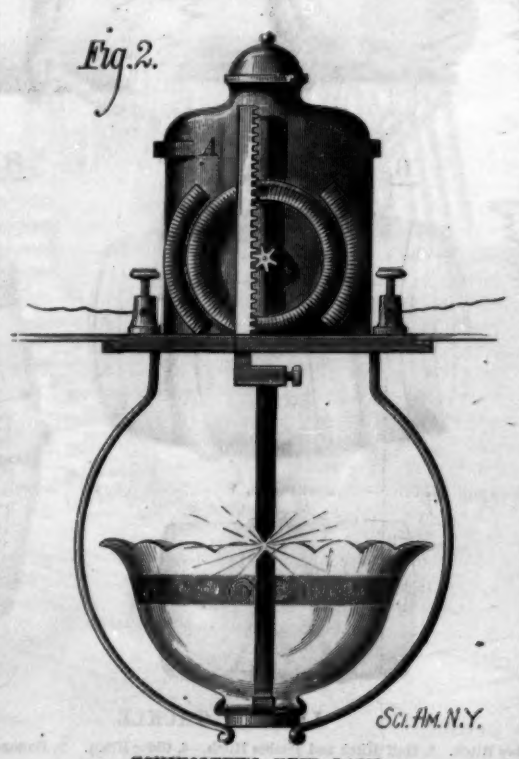
W. Tchikoleff, the head of the electric lighting department of the Russian artillery, has described, in *La Lumière Electrique*, a new lamp, the design of which was lately brought before the physical section of the Moscow Society of Naturalists, and which is represented by Fig. 1.



TCHIKOLEFF'S ELECTRIC LAMP.

E E′ are electro-magnets disposed like those on the other systems, and having poles, *a b*, spread out in circular form as in the Gramme machine. K is a Gramme or Siemens ring, the rotary motion of which causes the carbons to move through the intermediary of a double thread screw, A, and two nuts, B C, which carry the carbons. Lastly, D is a regulating screw, for the purpose of raising or lowering the luminous focus.

The current passes from the positive pole of the generator to the negative pole by three derivations, one of which includes the arc and traverses the ring by means of the contact pieces, *m n*; while a second, also including the arc, excites the electro-magnet, E (or both electro-magnets in a given direction); and a third which, without passing by the arc, influences the high resistance magnet, E′ (or both magnets in contrary directions), so that the action of this magnet upon the ring shall be in a reverse direction to that of E.



TCHIKOLEFF'S NEW LAMP.

In consequence of this arrangement the action of the electro-magnets upon the ring, K, is almost nil when the arc possesses its normal resistance; but when the resistance of the arc augments, the action of the electro-magnet, E, becomes weakened, allowing E′ to preponderate, and the ring, K, will rotate so as to bring the carbons into closer proximity. The contrary effect will, of course, be produced if the resistance of the arc should diminish.

Experience has shown that with such a lamp it is possible to obtain, with regularity and safety, a good electric light with twenty-four Bunsen cells, and at first with even twenty cells. Some of these lamps have been in use in the Russian artillery since 1877. This lamp may also be constructed on the principle of the Wheatstone balance.

The form of this lamp intended for public lighting is represented by Fig. 2. The rod, A, with the upper carbon holder, works by the effect of its own weight. When the current traverses the lamp the distance between the two carbons is maintained by the aid of helical coils, but these coils and the toothed wheel which controls the movements are worked, as in the former case, on the principle of derivations. When the current is interrupted, the carbons come into contact by the effect of the weight of the rod, A.

Certain details of construction have been omitted in this description, but enough has been given to make the principle clear.

To sum up, the advantages of this lamp may be enumerated as follows:

1. Its construction is extremely simple; it is free from clockwork mechanism, springs, and electrical contacts.

2. It does not require preliminary regulation nor any manipulation before or during its working.

3. Several of these lamps may be arranged in series in a circuit, and they are always in due relation with the intensity and the tension of the current which is to act upon them.

4. The lamp can work with comparatively weak currents, and also produce a very powerful light when the power of the current is augmented.

The inventor is convinced that the problem of the divisibility of the electric light by means of lamps having a voltaic arc can be solved only with the lamps based on the principle of the derivation of the current, which he discovered prior to Messrs. Lontin and Siemens.

Lamps with movable carbons, offering a certain resistance between their polar extremities, are, moreover, far preferable, from the point of view of divisibility, to lamps with fixed carbons, which may offer great variations in the resistance of the arc, in consequence of impurities, the action of the wind, etc. These variations may, in fact, be greatly reduced in the former description of lamp, and it is not necessary with them to employ currents of such high tension, or, if such currents be employed, additional lamps may be inserted in the circuit.

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court—Southern District of New York.

COLLENDER *vs.* GRIFFITH *et al.*—BILLIARD TABLE PATENT

Blatchford, J.

1. The fact that a mechanical patent was issued more than two years after the date of a design patent showing, but not claiming, a like invention, will not invalidate the former.

2. A billiard table having the broad side rails made of beveled or inclined planes shows sufficient utility and advantage in the way of cheapness of construction, as compared with a table having sides of curved or ogee form, to support a patent.

3. Reissued letters patent No. 6,469, granted to H. W. Collender, June 1, 1875, for an improvement in billiard tables, declared invalid in view of evidence showing the existence in this country of similar tables many years prior to the date of the patent.

United States Circuit Court—Western District of Pennsylvania.

KNEELAND *et al. vs.* SHERIFF *et al.*—PISTONS FOR DEEP WELL PUMPS.

McKennan, J.

1. Patent No. 53,630, granted April 3, 1865, to E. Y. Kneeland, for improvements in pistons for deep well pumps, sustained.

2. "A patentee whose patent is assailed upon the ground of want of novelty may show by sketches and drawings the date of his inceptive invention, and if he has exercised reasonable diligence in perfecting and adapting it and in applying for a patent, its protection will be carried back to such date." (*Reeves vs. Keystone Bridge Company*, 1 O. G., 466.)

U. S. Circuit Court—Southern District of New York.

WILLIAMS *vs.* BARKER *et al.*—WILLIAMS' PATENT RUBBER FLOCK MACHINE, PATENTED NOVEMBER 26, 1861.

Wheeler, J.

When the several elements of a patented machine differ from a prior machine only as to the form of certain parts common to both, the patent, in order to be sustained, must be restricted in scope to the improvements in the form of such parts.

Bill dismissed.

U. S. Circuit Court—Northern District of New York.

MAYNARD *vs.* PAWLING *et al.*—PATENT RADIATING CONDENSER, ISSUED JANUARY 30, 1877.

Blatchford, J.

Where the device sold by the defendants is capable of use independently of a feature necessary to the plaintiff's apparatus, and it does not appear that the defendants intended

that such feature should be added to their device, the case cannot be said to come within that class of cases where the seller of parts of a patented combination is liable for infringement if there be a concert of action proved or legally inferable between him and others who supply others parts necessary to the complete combination.

Bill dismissed.

AMERICAN INDUSTRIES.—No. 54.

THE MANUFACTURE OF ULTRAMARINE.

Ultramarine is a blue pigment, used extensively for paint, bleaching paper, printing calicoes, paper hangings, staining paper, blue printing ink, laundry blue, and various other purposes. Its shades run from a very light greenish blue, through light and dark clear blue, to a very deep pinkish blue. There are also green, violet, red, yellow, and white pigments of nearly the same composition, the two latter being mere curiosities.

The chemical composition of this color is not yet fully understood. The generally accepted theory is, that alumina, silica, soda, and brimstone enter into a combination, forming an aluminous silicate, and thus combining with the meanwhile forming sulphuret of soda produces the ultramarine. It is entirely free from poisonous substances, resists the action of alkalies to a high degree, is very permanent in air and light.

White lead changes under its influence to a dull brown, and should never be used with it, oxide of zinc being far preferable. It loses its color gradually if in contact with acids. It was formerly made from "lapis lazuli," an opaque blue stone, which is found in some parts of Europe, Asia, and South America. The lapis lazuli was pounded into pieces of the size of a hickory nut, calcined, and washed with water and vinegar. This process was repeated several times, until the stones could with ease be crushed to a fine powder. This was mixed with a paste of turpentine, rosin, wax, white pitch, and linseed oil, and kneaded thoroughly through a bag under water. The blue washed out through the bag was collected on filters. It was sold, according to quality, for $50 to $200 per pound, and consequently could not be of general use.

In 1814, lumps of a blue pigment were found in various soda furnaces in France and Germany, and the chemical analysis disclosed the fact that they were of nearly the same composition as lapis lazuli, the natural ultramarine.

In 1824, the Société d'Encouragement of France offered a prize of 6,000 francs for the artificial production of ultramarine, provided its price should not be above 600 francs—about $20—per pound. Guimet, of Toulouse, in 1828, succeeded in producing an artificial ultramarine of a very fine quality, and received the prize. He kept his process a secret, and, although the price sank rapidly to as low as $3 to $4 per pound, he grew immensely rich, producing, in 1834, at the rate of about 120,000 pounds a year.

At about the same time, and, as is positively asserted, prior to Guimet, Gmelin, of Tubingen, made the same invention, and published his researches in full, thus probably causing the supremacy of Germany in the manufacture of this beautiful pigment.

The first factory started in Germany was that of Leverkues, in Wermelskirchen, on the Rhine, in 1834; the second in Nuernberg, in 1838, by Leykauf & Heine. To-day there are thirty-four ultramarine factories in the world, producing about twenty millions of pounds annually. The establishment which we describe to-day ranks as the third in extent and importance, and furnishes about one-tenth of the entire product.

Up to 1869 several unsuccessful attempts had been made to manufacture ultramarine in the United States. The failure was attributed to the prices of labor, rent, and chemicals, which were much higher here than in Europe. In the fall of that year Messrs. Heller & Merz set up their machinery in a building, 50 x 125, in Newark, N.J. Success was the true companion of their energy, and in 1873 they bought a large tract of land at the eastern limits of Newark, N. J., and there erected new and extensive works, which have been gradually enlarged until they cover three acres of ground, comprising seven large buildings and several sheds, stables, and dwellings. The works are driven by two engines of 100 and 50 horse power respectively, and one hundred workmen are employed. A new engine of 250 horse power and two new boilers have lately been set up, and the old ones will remain for unforeseen emergencies.

In the process for the manufacture of ultramarine the following ingredients are used: 1. Kaolin (china clay), Glauber salt, and coal, or rosin. 2. Kaolin, soda, silica, sulphur, and rosin. 3. Nos. 1 and 2 mixed with or without silica, according to the desired shades.

The raw material must be ground by burrstones to an impalpable powder, thoroughly mixed, pressed into large crucibles or muffles, and calcined to a red heat in furnaces for from 12 to 36 hours, as the various qualities require. The firing is finished when the sulphur is nearly burned out. This operation must be watched very closely through holes in the brick work of the furnace. When the firing is completed the furnaces are closed nearly air-tight, and the material allowed to cool off. This will take from five to six days. On opening the furnace the material appears dark green when Glauber salt has been used. With mixtures 2 and 3 the color is a very dark blue. The green ultramarine must be roasted with finely powdered sulphur in pans or retorts under influx of air, to produce the lightest shades, which are called cobalt ultramarine. Either kind must be thoroughly washed, as large quantities of Glauber salt and sulphureted soda are formed. After the washing the ultramarine is ground in wet mills from two to five days. When the grinding is finished the pulpy mass is run into large iron tanks, where it is refined under the influence of heat and various chemicals, then repeatedly washed in large vats, and, after separating the various grades of fineness, dried in ovens, bolted, and packed.

The qualities of ultramarine made by Messrs. Heller & Merz are to-day, with the exception of a very few unusual brands, good as any imported, and their product always finds a ready market. Their share of the world's business in ultramarine is much larger than a statistical record will make it appear, for in Europe more than one half the ultramarine sold is adulterated to an incredible extent, while American consumers are looking sharp for a pure article. Thus, factories in Europe claiming a sale of 10,000 cwt., may, in fact, not produce more than 5,000 cwt. of pure ultramarine.

The chemical qualities of ultramarine are of importance only when used by paper manufacturers. They use it for giving the paper a white or bluish tint, but as the alum, which is used in treating paper materials, causes an acidity, which tends to destroy the ultramarine, it must be made to resist this action. This is done by the use of larger quantities of silica in the raw material, yet ultramarine can never be made entirely acid proof.

The product of Messrs. Heller & Merz is much more alum-proof than any of the European ultramarines. The alum test is made by exposing equal quantities of different samples of ultramarine, say five grammes, to the action of equal quantities, say two ounces of a saturated solution of alum, in test tubes. The chemical action will soon set in, particularly when the tubes are put in warm water, sulphureted hydrogen will evolve, and the ultramarine will change its color to a light blue and gray. The sample holding out the longest is the best for paper, *i. e.*, if the coloring strength is even. The coloring strength is tested by mixing equal quantities of ultramarine with about ten times its weight of finely ground barytes or gypsum upon paper with a palette knife, taking great care to weigh the quantities very exactly, and to not press too hard with the palette knife. The sample showing darkest when thoroughly mixed is the strongest, taking in consideration its bluish or reddish shade.

For laundry purposes ultramarine is generally put up in balls. It is thoroughly mixed with small quantities of an adhesive substance, such as gum arabicum, dextrine, starch, and is worked into a thick dough, rolled flat, cut into square blocks, and rolled by hand into balls. This work is generally done by children. Ultramarine is a better bluing agent than either soluble blue or aniline, on account of its more beautiful tint and its bleaching power. Prussian (soluble) blue particularly will impart to clothes a yellowish rusty tint after continued use. In using the ultramarine for this purpose it should be strained through a fine cloth and not allowed to settle lest it should spot. The price of ultramarine ranges from 10 to 30 cents per pound in large quantities, and some extremely fine qualities as high as $1. Violet ultramarine is made by exposing unground blue ultramarine to chlorine gas under high temperature, and red by exposing violet under low temperature to diluted nitric acid vapors. Both kinds are sparingly used.

Since the beginning of the manufacture of ultramarine in the United States the price has constantly declined, and it sells now at a much lower figure than formerly in spite of the higher duty. Prejudice and too much conservatism kept it out of the market too long, but now it is used in most places in preference to the imported article, on account of its even running qualities, its lower price, and on account of the responsibility of the manufacturers.

The large engraving in our present issue accurately represents the American Ultramarine Works of Messrs. Heller & Merz. The buildings occupy a ground space of three acres, the inclosure being 350x600. There are two distinct factories for the full process of ultramarine. In the front are small dwellings, which are omitted in the picture for the sake of clearness. The first building is 60x150, and the second 75x160. In the covered space between of 100 feet are the main factories, which are being rapidly filled with mills and furnaces. The engine house contains the large engine, two boilers, and a completely fitted up machine shop, where two machinists, with their attendants, attend to the new and repair work of the factory all the year round. The last building on the front line 100x75 is the paint shop where the blue paint used by oil refiners in painting barrels is ground. This, by the way, is quite a large business with this firm. On the rear line are sheds for bulky raw material, the cooper and carpenter shops, and the large store house, 160x60.

One of our views shows the dry mill room where the raw material is ground on 14 sets of burrstones, while another represents the furnace house. There are twenty furnaces, with a capacity for 30-75 cwt. of ultramarine, such large furnaces being quite a novelty in this branch. There is also a pottery connected with this establishment for making crucibles, of which this firm uses about 75,000 per annum.

One of the larger views represents the room for washing, grinding, and refining ultramarine. There are for this purpose eight large wooden tanks holding about 40 cwt. of ultramarine each, and 120 wet mills set up in rows. A large number of iron tanks and vats, also 72 wet mills, are in process of erection, and will, with an increased number of furnaces, raise the capacity of these works to 30,000 cwt. per annum.

One of the views shows the bolting and packing room, in which the men, with their clothes saturated with blue, present quite a novel spectacle. The ball blue room is also represented. Here about one half the ball blue for the United States is manufactured. The interior of the paint shop is also shown in the engraving. The consumption of chemicals in this establishment is very large—about 2,000 tons per annum. The space where these works now stand was formerly a swampy, fever-and-ague ridden spot. Dwellings are drawing nearer every year, giving the place the appearance of quite a little town. The continuous filling up of ground, and the extensive use of brimstone, which distributes large volumes of sulphurous acid gas, seem to have a very salutary effect. Fever has disappeared almost entirely, and the men look strong and robust. The salesroom of Messrs. Heller & Merz is located at 55 Maiden Lane, New York city.

English Fast Trains.

A correspondent of the *English Mechanic* writes as follows: A great stride seems to have been made, at the commencement of this half year, by all our railway companies, in the matter of speed, notably by the M. R. and G. N. R.

Some of the results attained by the latter are wonderful. The "Scotchman" will be quite in the shade shortly.

There are no less than eight trains daily, running from King's-cross to Grantham, 105½ miles, without a stop, and without picking up water, in 123 and 128 minutes each. In the case of the Leeds expresses, the speeds further on are yet more surprising.

From Grantham to Doncaster is 30½ miles, which distance is covered several times a day, without a stop, in 61 minutes.

From Grantham to Wakefield there are 73 miles, which are accomplished by the 6:30 P.M. down, *in 77 minutes*. This last run is at a speed, therefore, of 56·88 miles per hour.

Allowing for stoppages, this last mentioned train runs 186½ miles in 215 minutes, at a speed of 52·05 miles per hour.

Compare this with some other favorite performances. The "Dutchman" runs from London to Exeter in 4¼ hours, and stands on the road 20 minutes, thus running 193 miles in 235 minutes, or 49·5 miles per hour.

That is broad gauge; but their fastest narrow gauge runs from London to Birmingham, 127 miles, in 2 hours 45 minutes. Deduct 6 minutes, and we have running speed, 48·8 miles per hour.

Let us take a light M. R. train. The 10 A.M. from London is their best. It runs 192 miles (to Leeds) in 4½ hours, and stands 14 minutes. The speed, therefore, is exactly 45. Some of the runs, however, are very good. Sheffield to Leeds, 39½ miles in 49 minutes, means 48·5. I am not, however, quite sure that the shortened distance is as much as I have given.

Enough has been shown, however, to prove that the G. N. R. run, by a great deal, the fastest trains in the world; and not only that, but they run the greatest number of them; and also what our companies in the south might conveniently notice, is, that, with two exceptions, all convey third-class passengers in a state of luxury which second-class passengers on less favored lines might envy. Between London and Peterborough, and *vice versa*, there are daily 37 trains, doing the 76 miles in an hour and a half, more or less.

The good town of Leeds, of which I am a native, cannot but congratulate itself on the excellent catering of the M. R. and G. N. R., which has finally resulted in 19 express communications with the metropolis, each way daily. A minor point, worthy of notice, is that the L. Y. R. are waking up, and will seriously imperil the L. N. W. R. traffic between Leeds and Manchester, unless they wake up too.

Dry Fog.

It has been frequently noticed that during fogs near large towns the air is not saturated with moisture, the dew point in one instance being as much as 10° C. below the temperature of the air.

Seeing the possible connection between this phenomenon and the fact that the evaporation of water is greatly retarded by its surface being covered with a film of coal tar, the author made a series of experiments on the comparative rates of evaporation of water, when freely exposed to a current of air, and when covered with a film of coal tar or of coal smoke. It was found that the film retarded the evaporation from 92·7 per cent to 66·6 per cent.

The results of these experiments point out a condition of very common occurrence, competent to produce "dry fog," while they also explain the frequency, persistency, and irritating character of the fogs which afflict our large towns.—*E. Frankland, Proc. Roy. Soc.*

The Treatment of Rattlesnake Bite.

A professional snake catcher, of Holyoke, Mass., treats rattlesnake bites as follows: He first ties a cord tightly around the member bitten so as to cut off the flow of blood toward the heart. The bleeding wound is then sucked out thoroughly to withdraw as much of the poisoned blood as possible, after which strong spirits of ammonia is applied. After a while the string is loosened a little to allow the remaining poison, if any, to be so slowly absorbed into the system that no serious results are likely to follow.

IMPROVED WAGON JACK.

We give herewith an engraving of a very simple and inexpensive wagon jack, which has lately been patented and is being manufactured and introduced by Messrs. R. S. Hartzell & Co., No. 235 South Third street, Philadelphia, Pa. The cut shows the jack with one side removed to show the internal construction. The lifting device consists of three parts: the lever, A, the intermediate piece, B, and the follower, C. These parts are arranged in relation to each other, so that when the lever, A, is pressed down the follower, C, rises, and when in its highest position is locked

NEW WAGON JACK.

automatically by the short arm of the lever, A, and the intermediate piece, B, being then placed so as to take the full weight of the load on their pivots.

The standard, base, follower, C, and lever, A, are made of wood. The intermediate piece, B, and the shoes at the ends of the follower and at the end of the lever, A, are made of cast iron, and the cover which incloses the working parts is made of rolled iron. The jack is substantial, serviceable, and cheap.

Any further information in regard to this useful invention may be obtained from the manufacturers, whose address is given above.

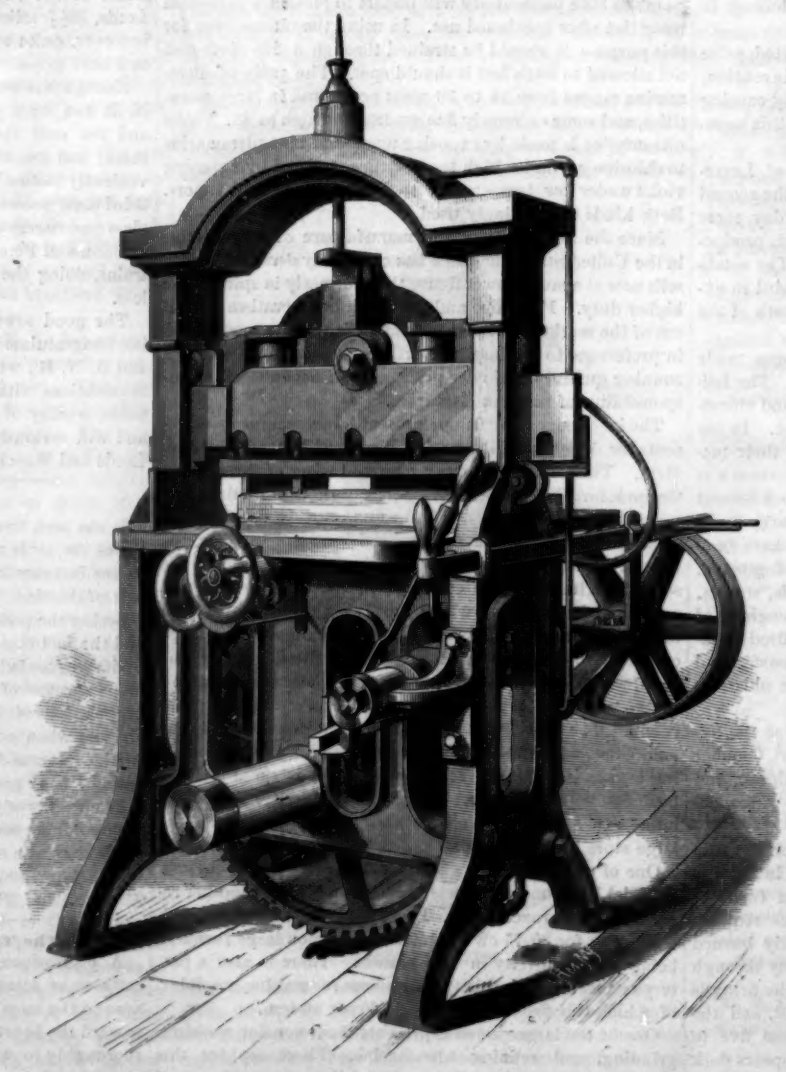
NEW AUTOMATIC CLAMPING AND PNEUMATIC PAPER CUTTING MACHINE.

Our engraving shows an improved paper cutting machine, invented by H. P. Feister, M.E., and manufactured by Rex & Bockius, No. 614 Filbert street, Philadelphia, Pa.

This machine in its construction is a new departure, and differs from former paper cutting machines chiefly in the use of compressed air to operate the automatic clamps for holding the paper while being cut, the compressed air being so applied that the same pressure which clamps the paper, also acts as a power, in an equal ratio, to help in the process of cutting, thereby relieving the gearing of a portion of the strain while making the cut, and avoiding the breaking of gear teeth so common to other machines.

Persons familiar with this class of machines will readily understand its working from the engraving, as it does not differ essentially from other machines of the kind, except in the application of compressed air to clamp the paper, and at the same time assist in cutting. It consists simply of a driving shaft, with a pinion and clutch, an air pump, and a large gear having a crank to impart an upward and downward motion to the table, the motion of the table also giving a lateral or draw cut to the knife bar as it rises upward in the operation of cutting. Secured to the table is an arched or curved yoke, fitted with pistons which have an upward and downward movement in cylinders secured to the paper clamp on its rear side, the clamp resting on pins slightly below the cutting edge of the knife. The knife is arranged to traverse to the right and left between rollers in the housings, and it has neither an upward nor downward movement.

In working the machine the operator pulls toward him the inclined lever, seen at the side of the machine, which throws in gear a clutch, starting in motion the large crank gear, which imparts an upward motion to the table, carrying with it the paper against the clamp, the clamp being held down firmly against its seat by the air pressure between the pistons and bottoms of the two air cylinders, the same movement of the lever which started the clutch having at the same time admitted air through a suitable valve to the two cylinders and underneath their pistons, and also at the same time to the cylinder on top of the machine, all the pressure entering the upper cylinder assisting in pulling upward on the table, by means of the connecting rod attached to the tongue on the yoke, and helping the gearing to force the paper against the knife, thus aiding in cutting the paper, while, at the same time, the two cylinders are holding it firmly in position to be cut. To make the process of clamping still more plain, it may be stated that the air clamp, being held down firmly against its seat, the upward movement of the table carries the paper against the clamp, it of course cannot move the clamp until the paper is pressed upward firmly against the clamp, after which the clamp, cylinders, yoke and table all move upward together until the end of the stroke is reached and the cut made, when they again move downward together until the lower end of the stroke is reached, when the clutch is automatically unshipped and the valve opened, releasing the air from their respective cylinders and loosening the paper from the clamp. The manufacturers claim that this machine will do twice as much work as other paper cutting machines with the same power applied.



FEISTER'S AIR-CLAMPING PAPER CUTTING MACHINE.

What is Space?

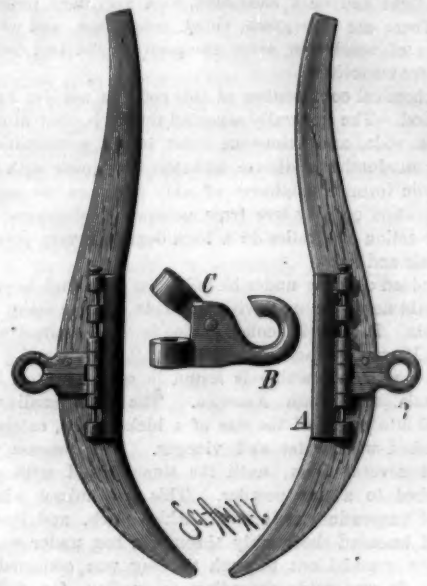
"Space is a real, objective, immaterial, extended, continuous, infinite, immutable, eternal, and absolute whole of capacity to receive extended substance, existing in trine extension of infinite length, infinite breadth, and infinite depth, which is ideally divisible in each dimension, into finite wholes of locality, all of possible forms and sizes, possessing the relations of similarity, difference, ratio, direction, distance, contiguity, and conjunctibility; and comprising units of trine extension, surfaces, lines, and points, each of which is infinitely divisible; trine extension into surfaces, surface into lines, lines into points, and points into infinitesimal fractions of position, which compose the infinitude of space, in a number which is formed by the involution of relatively infinite number to the seventh power."

This simple and lucid description is furnished by Rev. H. L. Gear, in an article on "The Concept of Space," in the Cincinnati *Baptist Review*. We trust that all our readers will be careful to bear it in mind always when they have to think of that fundamental concept. No end of intellectual difficulties arise from a neglect to form and hold just views of such important elements of right thinking.

IMPROVED HAME.

The engraving shows an improved hame lately patented by Mr. James M. Davis, of Peach Orchard, Ark. The invention relates principally to the irons for connecting the traces with the hames, the object being to permit of shifting the pressure on the horse's shoulder when necessary to avoid galling and irritation.

Plates, A, which are fitted to the convex face of the hames, have a series of jaws with recesses between them, and a hole through them to receive a pin which passes through them all. The hook, B, which connects the traces, is fitted to one of the recesses in the plate, A, and



DAVIS'S IMPROVED HAME.

is provided with a pivoted part, C, which fits in the adjacent recess and has an extension which meets the end of the hook and forms, when the hook is in place on the hame, a complete eye, from which the trace fastening cannot escape. The hook is thus made perfectly safe, and being entirely closed it is prevented from catching into the harness of another horse.

Should the horse's shoulders become sore the hook, B, may be readily shifted up or down by simply withdrawing the pin and placing the hook in a different position and replacing the pin.

This device is very simple and serves a very useful purpose in adjusting the draught to the best advantage, thus relieving the horse of a great deal of discomfort and in many cases actual suffering.

Further particulars may be obtained by addressing the inventor as above.

MECHANICAL INVENTIONS.

An improvement in wagon jacks has been patented by Mr. John Charles, of Clear Spring, Md. This invention relates to certain improvements in that class of wagon jacks in which a lever carrying two pawls or griping jaws is combined with a lifting bar having a double set of ratchet teeth, whereby the oscillation of the lever is made to cause the travel of the lift bar over the main section, to which the lever is pivoted. The improvement consists in pivoting the pawl jaws to the lever in such relation to springs on the main bar that the lifting bar may be made to travel either up or down without change in the adjustment by simply changing the range of oscillation of the lever.

An improved vehicle wheel hub has been patented by Mr. Lindsey Rossiter, of Port Carbon (Bridgeport P. O.), Pa. The object of this invention is to improve the construction of axles, axle boxes, and hubs, so that they may be conveniently oiled, will not leak or waste oil.

A press for bending rims of pianofortes to the shape required, and at the same time veneering them, has been patented by Mr. Frank Denninger, of New York city. This invention consists in a press bed of rectangular form, having combined with it loose presser blocks of the shape to which the rims are to be pressed, and fitted with clamping shackles and screws for compressing and holding the rims which are placed between the blocks in the press. The presser blocks are also fitted with adjustable gauges for retaining the rims in position.

Mr. Johannes A. Osenbrück, of Hemelingen, near Bremen, Germany, has patented a new bearing, which is simple in construction, and which can carry great weights without the friction which acts so destructively upon the bearings in use at present and renders them useless. The bearing is provided with one or more disks for distributing the lubricating material; these disks are below the spindle in case the same is vertical, and are rotated by the spindle by means of intermediate gearing in such a manner that the disks rotate in the same direction as the spindle, but their rapidity decreases in arithmetical progression from the end of the spindle.

One of the principal defects in an ordinary brake is that the shoe is fastened to the clog by bolts or keys that in a short time become loose, thereby causing a disagreeable rattling and increased expense and labor for repair, and the clog, in time, also works loose on the brake bar, because of the shrinking of the latter; and in ordinary brakes the brake guide ordinarily consists of a straight piece of iron fastened to the end of a brake bar itself, and consequently the guide does not always operate effectively. Messrs. Charles F. Wohlfarth and Clovis W. Wakefield, of Norwich, Conn., have patented a car brake intended to obviate these difficulties.

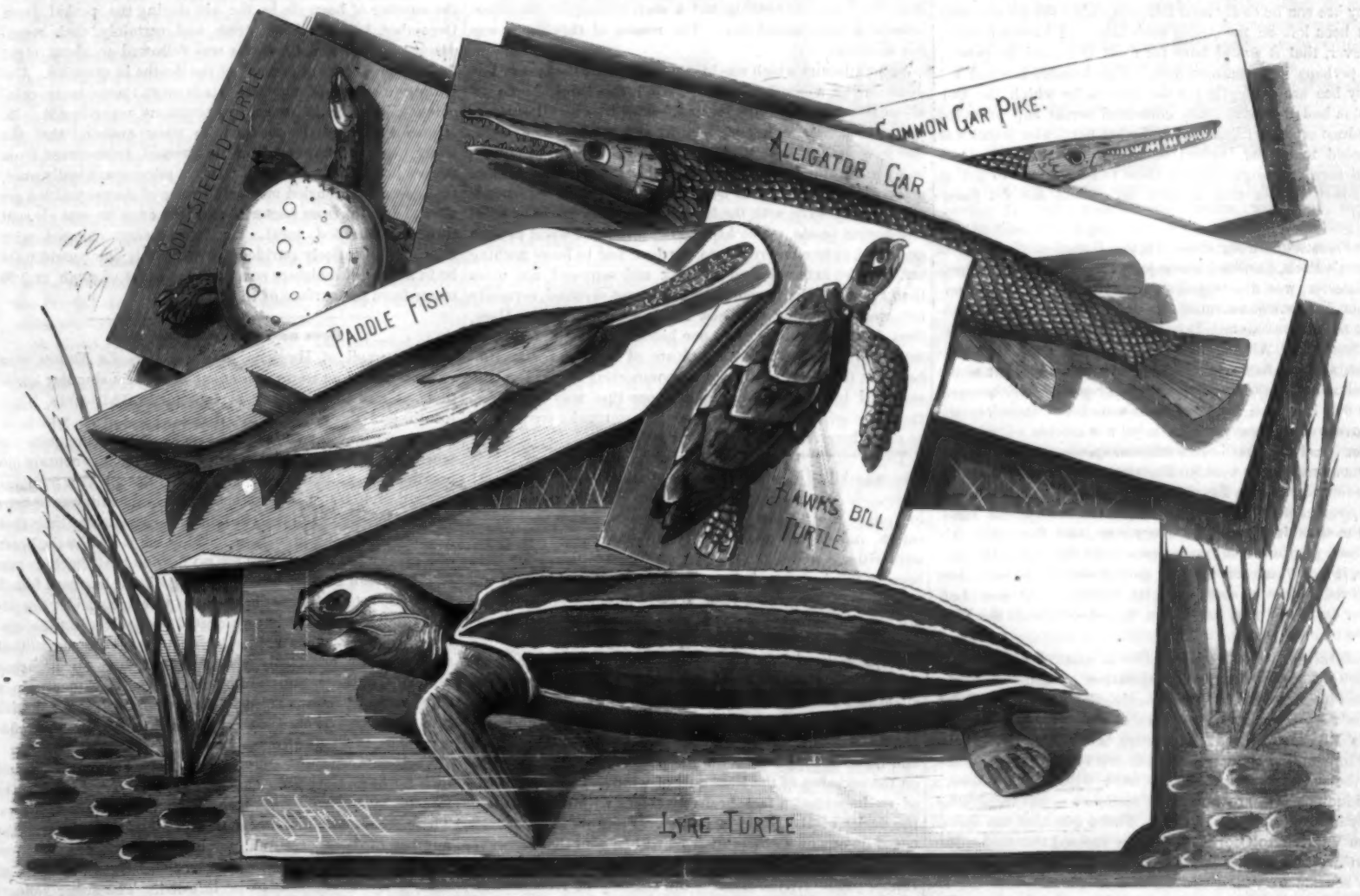
THE BERLIN FISHERIES EXHIBITION.

BY FREDERIC A. LUCAS.

The Fisheries Exhibition, which opened at Berlin on the 20th of April, is very wide in its scope, including, besides fishes and the apparatus used in their capture, and examples of the varied articles of food, oil, etc., prepared from them, almost all aquatic animals, such as seals, whales, turtles, and batrachians, down to shell fish and sea urchins. The United States National Museum, in conjunction with the Fish Commission, secured a space of 500 square meters, and sent a large and interesting collection, which was arranged under the supervision of Mr. G. Brown Goode. Among private individuals, Prof. H. A. Ward, of Rochester, sent a very creditable series of specimens, a few of which are shown on this page. Noteworthy among these is the lyre turtle (*Sphargis coriacea*), the largest of existing species, and *par excellence* a sea turtle. Until quite recently specimens of this were extremely rare; but during the past few years at least six have been taken between Newport and Cape Cod, having followed northward the warm waters of the Gulf Stream. Instead of the usual bony shield, this turtle is covered with small plates about the size of a ten cent piece, embedded in a thick leathery skin, from whence comes its popular appellation of leather turtle. The name of lyre turtle was bestowed upon it from its fancied resemblance to that musical instrument, the five dorsal ridges representing the strings. The paddles are nailless and covered with black skin a little suggestive of India-rubber. The animal figured was about seven feet long, and as much in width from tip to tip of the front flippers. The throat is lined with sharply-tipped spines, about an inch and a half long, and pointing backwards, so that whatever the animal starts to swallow must go down. The great size of this turtle—it weighs from 300 to 1,500 pounds—would render it a prize indeed were it not that the flesh is poisonous, and causes severe illness to any one rash enough to partake of it. Its home is the tropical Atlantic and the Mediterranean; but it is probably a mere straggler in the latter sea.

The beautifully mottled plates which cover the back of the hawk's-bill turtle (*Eretmochelys imbricata*) form the well known "tortoise shell" of commerce, and cause it to be much sought after. Thus its very means of protection becomes its greatest source of danger. The plates, when softened by heat, can be united in a homogeneous mass and worked to any required shape. The peculiar color and markings are now so skillfully imitated in horn that it is difficult even for an expert to recognize the difference; but as there will always be plenty of customers who want "the real article," it is not probable that the turtle will be any the less hunted. A great proportion of the sea turtles are captured by spearing them while asleep with a round pointed spear. This is technically called "pegging."

The soft-shelled turtle, of which we have several species, inhabits our Southern and Western streams. The central part of the carapace, or covering of the back, is of bone, but is covered with a smooth skin, and widely bordered by a thick but pliable leathery margin, under which all the extremities can be drawn. These turtles have extremely long necks, are remarkably quick and vigorous in their movements, and exhibit great ferocity when captured. Still



SPECIMENS AT THE BERLIN FISHERIES EXHIBITION.

their food seems to consist chiefly of insects and small shells.

The paddle fish (*Polyodon folium*) is a curious resident of the Ohio and its tributaries. It is said, and the statement seems plausible, to stir up the bottom for insects and crayfish, and pick them up in its capacious mouth. As it is also accused of a predilection for offal it is not used as food, although the flesh looks firm and palatable. Still its personal appearance is somewhat against it, for many people have strong prejudices against anything that seems at all uncanny. Some refuse to eat eels because "they look just like snakes," and the skate is held in abhorrence simply because it isn't a *pretty* fish.

The gars, one might almost say, are living fossils, for they are among the few existing representatives of the hosts of mail-clad fishes that swam the Devonian and Oolitic seas and carried terror and destruction among their weaker brethren. Compactly built, clad in silvery armor, and equipped with a goodly supply of wicked-looking teeth, they are true fresh water tyrants. Numbers of them are taken in seines, to the disgust of fishermen whose nets are torn by their teeth. The common gar is found west of the Hudson, and ranges from the great lakes to Florida and in the Mississippi and its tributaries. The alligator gar (*Lepidosteus platystomus*), so called from his short, broad muzzle, is a more Southern fish, and dwells from Florida to Texas, running some distance up the Mississippi. The Rio Grande is perhaps its headquarters, although it would seem on some accounts an ill-chosen habitation. Running up into the warm shallows when the river is high, the rapid fall of the waters entraps numbers of them in small pools. Then begins a veritable struggle for existence; the large fish prey upon the smaller ones, and in their turn fall victims to starvation or are killed by the evaporation of the little pond. This fish attains a length of four or five feet, sometimes six, and very rarely eight feet; but this last is exceptional. The common gar pike (*L. osseus*) is a much smaller and more slender fish, not often exceeding three and a half feet in length, and quite abundant in the great lakes and Western and Southwestern streams.

NATURAL HISTORY NOTES.

Origin of Flowers through Selection by Insects—Dr. Herman Mueller has, not long since, published a work in which he seeks to explain the existing variations in the forms of flowers on the principle of selection. His supposition is that insects of different tastes bred peculiar flowers, just as men breed peculiar races of cattle. Carrion-loving insects bred their kind of flowers, and long-tongued insects the tubular kinds, and many other classes of insects have, each class, bred the flowers they love best. Dr. Mueller has a note in *Nature*, of July 8, in which he points out that *Saxifraga umbrosa* has been adorned with brilliant colors through selection by dipterous insects of the family Syrphidæ. He says: Among diptera the most assiduous visitors of flowers are certain Syrphidæ, which, elegantly colored themselves, are fond of splendid flower colors, and, before eating pollen or sucking nectar, like to stop awhile, hovering free in the air, in front of their favorites, apparently fascinated, or at least delighted, by the brilliancy of their colors. Thus, I have repeatedly observed *Syrphus balteatus* hovering before the flowers of *Verbascum nigrum*, and often before *Melanostoma mellina; Ascia podagrica* before *Veronica chamædrys;* in the Alps, the lank *Sphegina clunipes* before *Saxifraga rotundifolia;* and, in my garden, *Ascia podagrica* before *Saxifraga umbrosa*. Of *Verbascum nigrum*, the main fertilizers are humble bees, diptera co operating only in a subordinate degree; in the case of the three other species, on the contrary, the above named Syrphidæ are such frequent visitors and cross fertilizers that we may safely conclude that it is by their selection of elegantly colored varieties that these flowers have acquired their beautiful peculiarity. Hence, in order to estimate the color sense of these Syrphidæ, it is worth while to consider what color combinations they have been able to produce by their selection. *Saxifraga umbrosa* being, as far as hitherto known, their finest masterpiece, we may, in the first place, look at the variegated decoration of this species. Its snow-white petals are adorned with colored spots, which, in size and intensity of light, gradually decrease from the base of the petals toward their extremity. Indeed, nearest to their base, within the first third of their length, there is a large irregular spot of an intense yellow;

about the middle of their length there follows a narrower cross band of red color, vermilion toward the base, intensely pink toward the outside, not reaching the margins of the petals, sometimes dissolved into several separate spots; lastly, beyond the middle of the length of the petals there are three to eight smaller roundish spots of paler violet pink color. The flowers of *Veronica chamædrys* prove that also gay blue colors are perceived and selected by *Ascia*.

Bees and Flowers.—Mr. Thomas Meehan, in a note in the *Bulletin of the Torrey Botanical Club*, says: I find that the behavior of bees is governed by circumstances. When flowers are abundant they visit those only which they prefer; at other times they examine anything which comes in their way. At the time I am writing, May 18, there is a dearth of garden flowers. Those of the early spring are gone, and the later ones are not well formed. But Columbines in many species are in bloom. The humble bee bores the ends of the nectaries and sucks the honey stored there; and the honey bee follows and sucks from the same hole what may be left, or what may be afterward generated from the honey gland. I have often watched closely to learn whether the honey bee bored for honey. Its quick motions are unfavorable to correct observation. I thought once I had caught it boring lilac flowers, but I afterward counted all the flowers that had been bored by the humble bee, and then watched the work of the honey bee on the cluster, and there were no more bored afterward than before. The Columbines (*Aquilegia*), with curved nectaries, such as *A. vulgaris* and *A. olympica*, are very favorable for observation, as the slit is made on the upper side of the curve, and the honey bee can be easily seen following after the crumbs that have been left on the strong one's table. I have no doubt, however, that it would bore for itself if it had the power, and perhaps it sometimes does. The humble bee and the honey bee are evidently not the insects for which the Columbine had this beautifully contrived nectar cup provided to induce cross fertilization; and what particular insect was designed to be the favored one, so that it, and no other, could turn its tongue around these twisted spurs to get at the honey in the end, I think no student has yet discovered.

A Fresh Water Jelly Fish.—In the Botanical Gardens, at Regent's Park, London, a new jelly fish, about half an inch in diameter, was discovered on June 10, by Mr. W. Sowerby, and has created no small stir among the zoological celebrities of the metropolis. It has already received two names, one from Prof. Allman and the other from Prof. Ray Lankester, and has formed the subject of two papers, one at the Royal and the other at the Linnæan Society. Hitherto no jelly fish has been found in fresh water, and therefore the discovery of this species is the more remarkable. Prof. Lankester concludes that it is a tropical species, as it is active only at a temperature of 90° F., becoming sluggish at 60° F. It comes nearest to a Brazilian species, and one might therefore suspect that it came originally with the *Victoria regia*. As the tank is cleared out every year, and this water lily has been grown several years from seeds ripened at the gardens, it seems singular that the animal should not have been observed before if such were its source. Professor Lankester thinks it may have been introduced from the West Indies.

Natural Spread of the Apple Tree in South America.—It is surprising how quickly the vegetation of many countries settled by Europeans has been modified. A writer in Petermann's *Mittheilungen* on the flora of Chili south of the Valdivia River, states that the scenery between the Rio Bueno and its winding affluents reminds one very much of home. In the park-like prairies, associated with *Fagus obliqua*, a deciduous beech, are numerous scattered apple trees, originally introduced from Europe. The apple tree has spread from Valdivia to Osorno, and even crossed the Andes into Northwestern Patagonia, and thence eastward. Indeed, it has become so widely spread, and so general, that the Indians from the distant regions of the Argentine rivers Rio Negro and Rio Colorado, are called manzaneros, or apple Indians. As a matter of fact, they and their kin in the provinces of Valdivia and Osorno live far more on the fruit of the apple tree than any European people, for it affords them both food and wine.

Irritability in Leaves of Robinia.—M. Phipson read a note at the recent session of the Academie des Sciences on development of sensitiveness in the common locust (*Robinia pseudacacia*). In his first experiment, tried last September, on an afternoon when the sun was shining brightly, he found that by giving the terminal leaflet a series of ten to twenty smart raps with his finger he was able to cause all the leaflets to close up, just as those of the sensitive plant do under like circumstances. On a second experiment he obtained the same results, and found that it took two or three hours sunshine to cause the leaflets to unfold again and resume their horizontal position. Heat applied to the terminal leaflet had no effect on the lateral ones, as it does in the sensitive plant, hence M. Phipson is led to conclude that the sap moves more slowly in the locust than it does in the latter plant. M. Phipson believes that these experiments add another proof of the truth of an opinion enunciated by him in 1876, to the effect that sensitiveness or irritability in the sensitive plant should not be regarded as a property peculiar to that plant, but rather as the highest manifestation of a phenomenon the traces of which are to be observed running throughout the entire vegetable kingdom.

THE AILANTUS TREE.

Not long since the well known authority on arboriculture, Prof. C. F. Sargent, urged the claims of the ailantus as a timber tree. Among other valuable properties, it was said to possess greater tenacity or ability to resist a strain than even the elm and the oak. Some experiments made in the French dockyard at Toulon showed that the ailantus, on an average of seven trials, broke with a weight of 72,186 pounds, while the elm yielded to 54,707 pounds, and the oak gave way under a pressure of 43,434 pounds.

Such a great tenacity as this, together with the rapid growth of the tree, ought certainly to make the ailantus worthy of culture for industrial purposes were it also durable when grown in exposed situations. The latter point, however, being one that has not as yet been ascertained, we are able to judge of the durability only from specimens seen in cultivation, and these would seem to give an answer in the negative. It is a well known fact that during the progress of the wind storms, which occasionally rise suddenly in this latitude during summer and sweep with terrific velocity through our streets, the very first tree to give way, in the majority of cases, before the brief fury of the storm, is the ailantus. This was notably the case in the hurricane of Sunday afternoon, June 13, when, out of the large number of trees blown down in various parts of our city, nearly every one was a to-all-appearances healthy specimen of this same Chinese "Tree of Heaven." All of the trees examined by us had snapped off close to the ground. In nearly every case the base of the trunk, although it gave no outward sign of the fact, had rotted away internally to a depth of two to three feet, leaving nothing but a shell to support the otherwise seemingly sound tree. The reason of this decay was not apparent.

In an ailantus which was blown down in Fifth Avenue last June during a similar storm of wind, the trunk broke off about two feet above the ground. This tree, to all external appearances, was extremely healthy and in vigorous growth, the bark being perfectly sound and the tree in full flower; but an examination showed that the interior was a mere mass of corruption from base to apex. The inner surface was literally alive with the large white fleshy grubs of some tree-boring beetle, which had riddled the heart wood to such an extent as to convert it into sawdust, and to leave nothing but a mere external shell of bark and sapwood not more than two and a half inches thick—a mere skeleton, certainly not well calculated to resist much wind pressure. Here, then, in this insect we have one hidden enemy at least that may prove disastrous to the culture of the tree for its timber, one that may even now be committing its ravages unobserved in trees still living, and one that may have been the cause of death of those trees whose trunks are allowed to stand here and there along our streets.

Two years ago the city was sued by the family of a lady who was killed by the fall of an ailantus tree in Eleventh street. It was proven by the plaintiffs that the tree was not in foliage during the year previous, and that it was hence rotten, and should consequently have been removed by the authorities. However derelict the authorities may have been in this instance, it is quite probable that this dead tree was no more dangerous than a large number of those that are now living, and filling the atmosphere with the unsavory odor of their blossoms.

A question of prime importance, therefore, for the lives of our citizens would appear to be this: How many of the ailantuses standing along the edge of our sidewalks are in the condition of the one above mentioned—all soundness and beauty without, but all rottenness and corruption within, and liable to topple over on the passer-by without warning on the occasion of the least gust of wind? The ascertaining of so important a fact probably comes within the scope of the duties of the Board of Health. From these statements, based on our own observation, it will be seen that, however great a future there may be for this malodorous tree as a timber producer, the ailantus can scarcely be recommended as a safe shade tree for the streets of a populous city like New York; and, moreover, that it would be prudent to give it a wide berth whenever the wind rises to more than ordinary velocity.

The Creosote Plant.

According to a note in a recent botanical journal, the resinous substance found on the branches of *Larrea Mexicana* has been proposed as a substitute for lac in the preparation of lac dye. The plant, which belongs to the natural order *Zygophyllea*, is a shrub from four to six feet high, growing in dense scrub-like masses in Mexico, especially on the borders of the Colorado desert, where its luxuriant growth forms an impenetrable mass of vegetation, effectually preventing the inroads of the drifting sand. The presence of this plant is said to be a sure indication of a sterile soil, little else being found where it flourishes, though the bright green of the foliage imparts a freshness to the surrounding scenery. The common name is derived from the fact that the plant has a strong creosote-like odor, which is so powerful that no animal will touch it. The resinous matter to which the smell is due is abundant in all parts of the plant, the branches being frequently covered with it, in the same manner as true lac. The resin itself is of a light ruby color. It is used by the natives in the treatment of rheumatism; it is also used by the Indians for fixing their arrow heads to the shafts, and for forming into balls, which they kick before them as they journey from point to point of their trail.

Bacteria in the Air.

By a certain process M. Miquel has succeeded in seizing and numbering the spores or eggs of bacteria, and while confirming M. Pasteur's observation, that they are always present in the air, shows that their number presents incessant variations. Very small in winter, it increases in spring, is very high in summer and autumn, then sinks rapidly when frost sets in. This law also applies to spores of champignons; but while the spores of moulds are abundant in wet periods, the number of aerial bacteria then becomes very small, and it only rises again when drought pervades the soil, a time when the spores of moulds become rare. Thus, to the *maxima* of moulds correspond the *minima* of bacteria, and reciprocally. In summer and autumn, at Montsouris, one finds frequently 1,000 germs of bacteria in a cubic meter of air. In winter the number not uncommonly descends to 4 and 5, and on some days the dust from 200 liters of air proves incapable of causing infection of liquors the most alterable. In the interior of houses, and in absence of mechanical movements raising dust from the surface of objects, the air becomes fertilizing only in a volume of 30 to 50 liters. In M. Miquel's laboratory the dust of 5 liters usually serves to effect the alteration of neutral bouillon. In the Paris sewers infection of the same liquor is produced by particles in 1 liter of the air.

These results differ considerably, it is pointed out, from those published by Tyndall, who says a few cubic centimeters of air will, in most cases, bring infection into the most diverse infusions. M. Miquel compared the number of deaths from contagious and epidemic diseases in Paris with the number of bacteria in the air during the period from December, 1879, to June, 1880, and, certainly, each recrudescence of the aerial bacteria was followed at about eight days' interval by an increase of the deaths in question. Unwilling to say positively that this is more than a mere coincidence, he projects further observations regarding it. M. Miquel further finds (contrary to some authors) that the water vapor which rises from the ground, from rivers, from masses in full putrefaction, is always micrographically pure, that gases from buried matter in course of decomposition are always exempt from bacteria, and that even impure air sent through putrefied meat, far from being charged with microbes, is entirely purified provided only the putrid filter be in a state of moisture comparable to that of earth at 0·30 meter from the surface of the ground.

Bees and Sugar Refineries.

The Council of Hygiene, of Paris, says *La Nature*, was recently called on to pronounce upon quite a singular question. There are in Paris, especially in the Thirteenth, Nineteenth, and Twentieth wards, depots of bee-hives, which, of little importance at the start, have finally become quite extensive establishments. Certain of these depots contain no less than from 120 to 150 hives. Now, as each hive contains upward of 40,000 workers, there are several millions of bees in each depot. At first sight it might seem surprising that a honey-producing industry should be carried on in the heart of a great city, where there are no flowers that the bees can visit to obtain nectar; but on investigation it has been found that these establishments have either through accident or design (undoubtedly the latter) located themselves in the vicinity of the large sugar refineries. The consequence is that the latter are constantly visited by the bees in immense numbers, to the serious annoyance of the workmen. In a short space of time the sirup pans are completely filled with bees, and the loss occasioned by this amounts, in one refinery alone, to about $5,000 a year.

Various means of extermination have been devised, but thus far to no purpose. One refiner, M. Say, destroys the insects by means of fly-traps placed near the windows. There are about 60 of these traps in his refinery, and the number of bees captured per diem in each one of them amounts to about a quarter of a bushel. But in spite of all this the works continue to be infested. The sugar refiners have asked for damages, but at present the Prefect of Police has at his disposition no ordinance which will permit him to allow them. The refiners will be obliged to suffer the loss and inconvenience till the Council makes some ruling on the subject.

AGRICULTURAL INVENTIONS.

Mr. John L. Brinly, of Louisville, Ky., has patented an improvement in plows, the object of which is to prevent the plow from being broken should the front bolt that secures the plow to the beam break, and to facilitate the renewal of the land side when worn.

An improvement in plows has been patented by Mr. Zeadock R. Percefull, of Port Smith, Ark. This invention relates to a combined mould board or turn plow and subsoiler; and it consists in a vertical standard blade, having a mould board adjustably fixed thereto on its side, and carrying at its bottom a point in advance of the mould board, and just in rear of this a share and heel piece, by which arrangement the furrow is turned by the mould board, the earth pierced in advance of the mould board by the subsoil point, and then broken by the share in the rear, the adjustable connection of the mould board affording means for regulating the relative depth of the furrow and subsoil track.

Mr. Perry R. Weatherford, of Waverly, Ky., has patented a combined rotary and drag harrow, so constructed that it can be adjusted to work at any desired depth in the ground, and can be readily raised from and lowered to the ground.

RECENT INVENTIONS.

An improved grub and stump puller has been patented by Mr. Joseph J. Marshall, of Pulaski, Tenn. This invention consists in a novel construction and arrangement with relation to each other of the arms which form the jaws, whereby lightness, strength, and efficiency are obtained.

Mr. Edwin A. Roth, of Philadelphia, Pa., has patented an improved milk cooling apparatus, in which the suspended vessel used for containing the ice is provided with a flexible drain pipe, which admits of using the ice receptacle as a cream receptacle.

An improved holding tool has been patented by Mr. John S. Birch, of Orange, N. J. The invention consists in constructing the holding tool with the case in the shape of a tube flattened upon two or four sides to give a side support to the jaws; also, in forming grooves in the sides of the jaws and in the inner surface of the sides of the end of the case to prevent the jaws from slipping when under strain.

An improvement in the class of devices known as "self-acting car couplers" has been patented by Mr. Charles J. R. Ballard, of Watertown, N. Y. The invention consists, essentially, of a pair of double hooks or links crossed and pivoted together at their centers, with a coiled spring between them, so that they will open and admit a coupling pin and then close upon it and hold it firmly in their jaws.

An improved apparatus for receiving and recording votes has been patented by Mr. Richard S. Conover, of Sayreville, N. J. The inventor states that by means of this invention election frauds will be prevented and the number of votes cast will be strictly controlled and quickly counted.

An improved ore concentrator for washing the impurities out of ore and depositing the ore in suitable receptacles, has been patented by Mr. John McColl, of South Ryegate, Vt. The invention consists in the combination, with two or more endless carriers provided with transverse riffles, of a hinged platform provided with amalgamated copper plates and perforated iron plates, upon which platform the crushed ore or pulp is fed, whereby the particles of ore drop through the perforations in the iron plates, the gold being held by the amalgamated copper plates of the platform and amalgamated copper rollers pivoted below the platform. From the platform the particles of ore drop upon the upper endless carrier, are then washed off on to the lower carrier, and are then washed off from that, whereby the dirt and impurities are carried away by the waste water, and the particles of metal are deposited in suitable receptacles.

Mr. John Sandles, of Hinsdale, Ill., has patented an improvement in washing machines, which consists of a circular plunger made to nearly fit the tub, and provided on its under side with several circular cups, that are so fastened to it that they can revolve in a horizontal plane.

An improved machine for mixing materials for making soap has been patented by Messrs. William Cornwall, Sr., William Cornwall, Jr., and Aaron W. Cornwall, of Louisville, Ky. This invention relates to an improvement in machines for mixing fats and alkalies for making soap, and also for mixing various other substances which are plastic or liquid. The improvement consists in the construction and arrangement of the rotating arms of the mixer proper. The arms are each made of two flat blades or paddles, which are set at an angle to each other, and connected so as to extend radially from the rotating shaft. The corresponding paddles of adjacent or neighboring arms are also set at opposite inclinations to the plane of rotation.

Messrs. William Burkart, of Smithville, Ind., and John M. Burkart, of Canton, Kan., have patented an attachment for organs, pianos, and other similar musical instruments, by which the leaves of music can be turned without the necessity of removing the hands from the key board. The invention consists of a plate to be applied to the music rest, fixed fingers to hold the covers, open movable fingers to grasp the leaves, levers for operating the movable fingers, cords running from the levers to a knee lever under the key board, and tension devices for regulating the movement of the levers, all arranged so that by pressing against the knee lever the leaves of music are successively turned.

Mr. John S. Affleck, of 16 South William St., New York city, has patented an improved packing ring for boiler tubes, which is so constructed that it will adjust itself to any imperfections in its seat, and will melt should the boiler become unduly heated. This ring is especially applicable to the class of boilers made wholly of tubes and joined at the ends by connectors. With this packing, should the water get low in the boiler, and the boiler become unduly heated, the packing rings will melt and allow steam to escape and give warning before the overheating has reached a dangerous point.

Mr. Richard B. Lanum, of Circleville, Ohio, has patented a grave torpedo which is so arranged that if placed in a grave it will explode if any attempt be made to rob the grave.

Mr. Frank L. Sheldon, of Rahway, N. J., has patented a fishing basket which is so constructed that it may be readily folded into small compass for convenience in carriage.

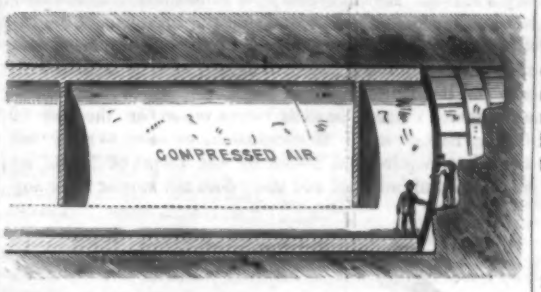
VON HEEREN proposes a method of cooling hot journals by a mixture of sulphur and oil or grease. The fine metal dust formed when a journal runs hot, and which strongly acts upon both journals and bearing, forms a sulphide of sulphur. This compound, which grows soft and greasy, does not cause any appreciable amount of friction. It has been very successfully used by the steamers of the North German Lloyds.

A SAFETY APPLIANCE FOR THE HUDSON RIVER TUNNEL.

BY P. H. VANDER WEYDE.

Allow me to suggest a safety appliance which is adapted to be used as soon as the connection of the Hudson River Tunnel with the vertical shaft is completed by help of the coffer dam at present in course of construction; then all danger from the rear will have ceased, and only a break in soft soil when reached by the tunnel head has to be feared. My project will prevent the air from escaping and the whole tunnel to be filled with water and mud, even if the whole head caved in suddenly.

My plan consists simply in a plain movable solid circular shield or partition, to be placed against the top and sides of the tunnel, and closing it except three or four feet from the bottom, where the men can pass under it. It is made to fit well, while the joint with the wall is kept air-tight by mud or clay. This partition is advanced from time to time, and kept as close to the men as convenient to them. When a caving in of the tunnel head takes place and water gains access in great quantity, while the air escapes at the top, this partition will prevent the rest of the air in the tunnel from being lost, and allow only that to escape which is between it and the tunnel head, while all the rest of the air will be kept back, as the water or mud will not be able to rise above the dotted



line shown in our figure. In case of such a calamity the men have only to pass under the partition to have the upper part of their bodies in the air, so that they cannot be drowned nor suffocated in the mud, while the compressed air will keep this down to the dotted line.

According to incomplete theory there would be no tendency to displacement of such a partition, as the pressure is always equal on both sides, whether it be water or mud on one side and compressed air on the other. We suggest however, that the pressure of the water on one side, being variable with the tides, and the perhaps still greater variability of the air pressure on the other side which it is practically impossible to keep up to the same standard, especially when a break occurs, would make it necessary to keep this screen or shield well braced, so to as be secure against its displacement in case of an emergency, as this would diminish its protective capacity by allowing air to escape toward the break.

Inventors and the War Office.

A question asked in the House of Commons one evening this week, the reply given to it by Mr. Childers, and a comment on that reply by Colonel W. Hope, appearing in the *Times* recently, give cause for reflection and comment. Mr. O'Shea inquired whether an offer had been lately made by Lieut.-Colonel Hope and General Ripley to supply 200 breech-loading naval guns to the Government, 80 per cent lighter, 60 per cent cheaper, and about ten times stronger than those of the Woolwich pattern, the said guns not to be paid for till they had been found to be in all respects satisfactory to the department; and whether this offer had been refused by General Campbell. Mr. Childers replied that substantially such an offer had been made to his predecessor, that Colonel Hope and General Ripley had been furnished with a copy of the 1869 regulations, drawn up to deal with inventors, and that the gentlemen in question declined to comply with the first condition requiring all inventors to describe their inventions; this refusal disqualifying them from receiving further official attention. Colonel Hope's letter discloses some interesting features of departmental correspondence. He states that in answer to his offer, General Campbell replied in effect: "Before I can come to any decision as to the expediency of considering your application for a grant of money with which to conduct experiments and perfect your inventions, you must tell me all your secrets." Which reply, as Colonel Hope points out, had nothing to do with the proposition made to supply 200 guns, which should be subjected to any conditions of trial and proof that could be desired, and to receive no payment till these guns had been approved by the authorities. No wonder that, under these circumstances, Colonel Hope asks, "Why do officials treat inventors as natural enemies?" We are by no means as sanguine of the invention of Colonel Hope and General Ripley as these two gentlemen naturally are, and we fail to see why they should not have first offered one of their marvelous guns for proof to the department conditionally upon 200 being afterwards ordered, instead of requiring so large a number to be accepted at once. On the other hand we are aware that inventors are not unfrequently, perhaps generally, so great a nuisance to the War Office, that restrictions which must silence a large majority of them at the outset are very necessary. But surely intelligence, and not routine wholly, should guide the heads of the department in dealing with the numerous applications made to them; and an offer, involving nothing but a slight amount of labor in testing and reporting, should not be met by a reply adapted only to silence a needy and pertinacious schemer. The matter will hardly rest where it now is, and the discussion may possibly be of more use to the country than the guns to which it has given rise may be to the service.—*Engineering.*

Correspondence.

A Meteorite in British Columbia.

To the Editor of the Scientific American:

Your number of the 6th of March contains an account of the finding of several meteorites. Last summer, while on a canoe trip with an Indian crew, I visited Chilcat, at the head of Lynn Canal, latitude 59° 14', longitude 135° 40', I found a meteorite in possession of an Indian, who gave the following version of finding it:

He was in the interior, on the watershed of the Yukon, fur trading. One day while resting he heard a loud buzzing noise overhead, and immediately afterward, at a short distance, a tree was struck and broken off. On examination he found the meteorite, which he packed to the sea coast. It is used as an anvil, and I should judge it weighs over 40 pounds. From his story it must have been procured about 125 miles inland in British Columbia.

The coastal tribes are the middlemen of the interiors, making annual visits with supplies of powder, balls, blankets, etc., for the purpose of barter. The furs accumulated are sold to the white traders here and at Sitka. They do not permit the interiors to visit the coast, except occasionally a chief in charge, and then he is not permitted to trade with, and in fact not to see, any whites or outside Indians.

W. H. WOODCOCK.

Fort Wrangel, Alaska, July 13, 1880.

A Novel Spray Bath.

To the Editor of the Scientific American:

After two or three hours of fruitless labor, endeavoring to entice the trout with hackles, gnats, coachmen, magpies, butterflies, etc., I gave it up in despair, and, following the example of the trout, sought a secluded, shady nook, where I lay down for a nap, hoping that toward evening success would crown my efforts at fishing.

The spot was a delightful one. At my feet was a lovely ripple, and overhead was dense foliage of cottonwood and willow. The thermometer stood at 103°, and the sky was cloudless and perfectly Italian in its azure, but a light breeze across the rippling water, with the shade above, rendered my situation more than endurable.

I lay on my back, but had barely gotten comfortably fixed when I felt cool particles like water falling on my face. Surprised, I looked carefully through the foliage above me, and wherever the light was favorable saw fine spray falling quite fast through the leaves. For some minutes I watched in wonder, and tried to account for the phenomenon by the combination of the heated air without and the water and shade beneath, affected by the light breeze, causing condensation of the air's moisture, but could not satisfy my mind by this theory.

After enjoying the falling of the cool particles on my face for a while longer, I proceeded to examine the foliage above me. The particles were now clearly seen to be emitted from the leaves and twigs. A closer examination led to the discovery that thickly distributed over these parts were many little insects, and to my great surprise I saw that the particles of spray were ejected by convulsive but quite periodical movements from the anal extremity of the abdomens of these little animals. After careful watching I learned that they each ejected from twenty to thirty particles of water a minute, indicating a wonderful power of drinking the sap from the tree on which they were feeding.

Inclosed are specimens of the insect, which I hope will be recognizable after the long journey; also a twig from the tree on which I found them.

This is not offered as being new to the scientific world, but as entirely so to myself, and as matter which may interest some of the many readers of your valuable paper.

C. A. W.

Lapwai, Idaho, July 17, 1880.

Buttermilk as Summer Food, Drink, and Medicine.

A Detroit physician asserts that for a hot weather drink nothing equals buttermilk. It is, he says, "both drink and food, and for the laborer is the best known. It supports the system, and even in fever will cool the stomach admirably. It is also a most valuable domestic remedy. It will *cure* dysentery as well and more quickly than any other remedy known. Dysentery is really a constipation, and is the opposite of diarrhœa. It is inflammation of the bowels with congestion of the 'portal circulation'—the circulation of blood through the bowels and liver. It is a disease always prevalent in the summer and autumn. From considerable observation I feel warranted in saying that buttermilk, drunk moderately, will cure every case of it—certainly when taken in the early stages."

IN coining $90,000,000 in silver and $22,000,000 in gold at the San Francisco Mint, in 1878, there was lost only $29. The carpet, which had been down five years, was taken up last spring, cut up into small pieces, and burned in pans. The *débris* was put through the same process as the mining dust, and there was got from the old carpet $2,500!

The Chicago Case of Skin Grafting.

The remarkable attempt to graft a section of skin from a boy's leg upon the thigh of his sister, described in a late issue of the SCIENTIFIC AMERICAN, unhappily proved a failure. The skin refused to adhere, shriveled, and became dry and hard. The narrow connecting hinge of skin was so sharply folded back that the life of it was destroyed, the circulation being cut off by the pressure which could not be avoided.

The brave boy who had made the sacrifice for his sister's sake was willing to endure another trial, but the physicians decided against it. It was thought best to make the second trial with the skin of a lamb, as soon as the burned child's strength should be sufficiently recruited. The proposed plan of operation is this: A mould of the lamb will be taken in plaster of Paris, so that the animal can be kept perfectly still in juxtaposition to the sufferer. Then the skin of the lamb, closely shorn, will be flayed for the space of 6 inches by 2½, leaving the skin uncut at one end of the strip. Under this loosened strip of skin a piece of soft white silk will be placed to keep the wound clean and facilitate the formation of blood fibers. When the "sprouting" is sufficiently advanced the silk will be removed, and the fibrous inner coating of the lambskin will be applied to the wound of the child, the lamb being bound as the boy was. Great confidence is felt in the success of the new method.

THE ACME CUBE PIPE TONGS.

These tongs, which were patented March 18, 1879, are manufactured by Messrs. Noble, Hall & Co., of Erie, Pa. The main features are shown in the engraving.

The rivet or pin has a bearing on each end. This construction gives a firm bearing and avoids the twisting which is usually so destructive to ordinary tongs which has but one bearing, thereby saving the pin from wearing and breaking, besides the bit is held square and in line with pipe, which gives it a good hold or bite.

The check piece on one handle has a recess formed in it for receiving a cube or bit of hardened steel. This bit is held with one of its cutting edges directly or a little above the center of the pipe, whether the pipe is large or small.

It will be noticed that the cube has twelve available cutting or holding edges, so that as one edge becomes dulled by use, the tapering pin, which holds cube in, can be taken out and a sharp edge of cube placed toward pipe for use, until all of the twelve edges have been used. Then when all of the holding edges have been worn, the cube may be sharpened by grinding, and when entirely worn out, can be replaced by a new one at a slight cost. This patent also covers a flat bit, which has only eight holding edges. One of the jaws is made adjustable with a thumb screw, to adapt the tongs to different sized pipes.

This firm also make tongs of the same general character without the adjustable jaw and with flat bit. The manufacturers claim that for strength, durability, cheapness, and lightness, these tongs have no equal in the market. For circulars and prices, address Noble, Hall & Co., Erie, Pa.

THE ACME CUBE PIPE TONGS.

Severe Hail Storms.

Not a summer passes that we do not hear of hail storms of "unprecedented severity" in many parts of our broad land. This summer is no exception to the rule. Perhaps the most remarkable fall of hail, thus far reported, occurred in Warren County, Mo., July 1. The extent of the storm was about 20 miles by less than 1 mile in width, the heaviest fall of hail covering about 2 square miles. Mr. G. O. Hardeman, of Gray's Summit, assures us that the hail-stones were of various shapes, and ranged in size from that of a hazelnut up to blocks of ice 20½ inches long, 5 inches wide, and ½ inch thick. The hail fell to a depth of 5 or 6 inches on a level, and in places where it was drifted against houses or fences it reached a depth of a foot or more. The damage done was very great, the ice smashing not only windows, but sashes and blinds; and the roofs of all the houses in the path of the storm were so injured that new roofs had to be put on. All growing crops were destroyed, and nearly all the poultry in the region were killed, besides many hogs. The horses, mules, and cattle exposed to the storm were badly bruised; some had their eyes knocked out, and others were so seriously battered as to be unfit for use for several days. Forest trees were greatly injured, the bark being torn from the sides exposed to the storm.

Cast Iron Car Wheels.

Cast iron car wheels, as is generally known, are little used in Europe, and are generally regarded there as very dangerous, and especially unfit for use under passenger cars. We might suppose this opinion to be founded on ignorance, were it not that some cast iron wheels have been used for many years, especially in Austria, there being some Hungarian iron works famous for the "chilling" property of their iron. But as, in spite of this long experience, the opinion prevails there that cast iron wheels are not only inferior, but positively unsafe, so much so that we believe many companies will not permit cars with cast iron wheels to pass over their roads, though loaded with freight for stations on or beyond their lines, it has naturally been supposed in this country that the European chilling iron must be greatly inferior to ours. But it now seems questionable whether the cast iron car wheels in Europe are not quite good and safe. An Austrian engineer, Mr. Emil Stotzer, foreman of the shops of the Empress Elizabeth Railroad at Linz, calls attention to the fact that during the past winter, which in Europe was an exceptionally severe one, while the cases of *tire* breakages amounted to thousands, and not a few accidents were due to this cause, so far as is known there was *not a single case* of the breakage of a cast iron wheel, at least not one which interrupted traffic. In view of this he suggests that the prevailing prejudice against cast iron wheels should be abated, and that a great deal might be gained if at least all the freight cars that have no brakes should be provided with cast iron wheels, but thinks that experiments should be made with cast iron wheels under brakes also. He mentions the use of cast iron wheels under passenger cars in this country, but seems not to understand how general this use is, and that of the 496,718 cars reported by "Poor's Manual" as the stock possessed by our railroads in 1879, probably 495,000 have cast iron wheels.—*Railroad Gazette.*

Pressure of Wind.

The question of the amount of pressure to be assigned to wind in calculating the stability of structures does not, hitherto, appear to have received in England any satisfactory solution. Recent events have sufficiently demonstrated its importance, and yet we find that the President of the Institute of Civil Engineers and one of the railway inspectors of the Board of Trade are both agreed that no definite rule exists on the subject. These gentlemen, Mr. W. H. Barlow and Colonel Yolland, in their recent report on the loss of the Tay Bridge, say: "In conclusion, we have to state that there is no requirement issued by the Board of Trade respecting wind pressure, and there does not appear to be any understood rule in the engineering profession regarding wind pressure in railway structures; and we therefore recommend that the Board of Trade should take such steps as may be necessary for the establishment of rules for that purpose."

It is perhaps natural that Colonel Yolland and Mr. Barlow should consider that the Board of Trade is the proper authority to decide upon this doubtful point, as to this department has been intrusted the testing of the safety of railway structures, and the strains to which iron and steel may be subjected, before the public are allowed to pass over them. The Board of Trade, moreover, possesses a recognized authority to which all engineers are obliged to defer. However, Mr. Rothery, the other member of the court of inquiry, does not take this view of the matter. His opinion is very clearly expressed in his separate report. Referring to the paragraph in the report of his colleagues quoted above, he says: "I cannot, however, join in that recommendation, for it appears to me that, if there is no understood rule in the engineering profession regarding wind pressure in railway structures, it is for the engineering profession, and not for the Board of Trade, to make them. I will add that, if I rightly understood my colleagues at our last interview, they concurred with me in the conclusions to which I had come, that there might be a maximum wind pressure of from 40 lb. to 50 lb. per square foot, and this not only over a few feet, but over the whole extent of a span of one of the high girders, and I gather as much from their report. And, if so, seeing that it is the practice in France to allow 55 lb. per square foot for wind pressure, and in the United States 50 lb., there seems to be no reason why a similar allowance should not be made in this country."

The question really belongs to the science of meteorology, and can only be settled by the examination of careful observations, taken with accurate instruments, and extending over a series of years. It might be interesting to ascertain upon what grounds the French and American engineers have fixed upon the values they assign to wind pressure; but we think that sufficient data exist in this country to arrive at an independent conclusion.

Any one might be led to suppose, from the vagueness of the views expressed on the subject, that there were no records in existence in England on the rate or force of the wind. On turning, however, to the meteorological observations of the Royal Observatory at Greenwich, printed by the Government in a yearly volume with the various other observations, we find most valuable information, both on the daily rate and maximum force of the wind. For the purpose we are dealing with, the maximum force is the quantity required. It is true that, given a certain velocity, it is easy to deduce, by means of a simple formula, the corresponding pressure. A formula used for this purpose on the Continent is: Pressure in kilogrammes per square meter $=\frac{1}{16}$ (meter per second)^2, which converted into English measures, is: Pressure in lb. per square foot $=\frac{1}{10000}$ (foot per second)^2. Unfortunately, however, the observations of velocity are only given in the form of the total distance traversed by the wind during the whole of each day, as measured by the revolutions of an anemometer; and this is the only form in which the motion of the wind is recorded in many observations. This would merely enable us to calculate the average wind pressure throughout the day, which is quite a different thing to the maximum pressure. The wind on very stormy days blows frequently in gusts, and what we require to know is the force or pressure of the strongest gust which has occurred as far back as the observations extend. For instance, for determining maxima wind pressures, the observations at the Radcliffe Observatory at Oxford in past years are of little value, as, for example, though on one occasion, April 14, 1867, the wind, as recorded by the anemometer, traveled at the rate of 1,004 miles in the day, which furnishes an extremely high average speed for a whole day, it appears from the Greenwich observations that no unusual pressure occurred on that day. At Greenwich Observatory, fortunately, the maximum pressure each day has been recorded for several years. We have looked through the published records of the Observatory for the years 1865, 1866, 1870, and 1877, the three first being years during which we knew some severe storms had taken place, and the year 1877 being apparently the latest record hitherto published. In the year 1866, the maximum pressure of wind occurred in January, and amounted to 32 lb. per square foot, and in February and December it reached 30 lb. per square foot. It was in the month of January of that year that the London foundered in the Bay of Biscay during a violent storm. The greatest pressure of wind in 1867 occurred on the 8th of February, amounting to 41 lb. on the square foot. This great pressure, however, was nearly reached again on the 12th of March in the same year, when a pressure of 40 lb. was recorded. The maxima pressures in January and October of that year were 35 lb. and 30 lb. respectively. In 1870 four records are given, in different months, of the pressure being more than 30 lb., no actual figure being given; and on three other occasions in that year the pressure reached that amount. The highest pressure in 1877 was 32·6 lb. in the month of November. It is evident from this brief glance at the Greenwich Observatory records that the pressure of 30 lb., adopted by some eminent engineers, is considerably too low to be received as a standard maximum pressure, and that even 40 lb. is insufficient. It is possible that a thorough examination of the whole of the Greenwich observations might indicate a higher maximum even than the one we have given. Also, it must be borne in mind that Greenwich Observatory is not situated near the sea, or in a specially exposed position, so that a maximum recorded there might be exceeded in some other places. In a treatise on "Meteorology," by Dr. Loomis, an American professor, published in New York, the velocity of the most violent hurricane is stated to be 100 miles per hour, with a corresponding pressure of 49 lb. per square foot, which may, perhaps, be the basis upon which American engineers have founded their rule of taking 50 lb. as a maximum. Professor Rankine, however, states, in his "Treatise on Civil Engineering," that the maximum pressure of wind observed in Great Britain amounts to 55 lb. per square foot. The rule followed in Belgium is to assume a wind pressure of 275 kilogrammes per square meter for places on the sea coast, and 176 kilogrammes for places inland; which, converted into English equivalents, amounts to 56 lb. per square foot on coast, and 36 lb. inland. With these facts before us we feel bound to concur in the opinion expressed by Mr. Rothery; and we consider that English engineers should no longer hesitate to accept 55 lb. per square foot as a possible pressure of wind in very exposed situations, and to design structures in future, subject to this consideration, with a proper margin for safety. Also, we hope that all observatories will follow the example of Greenwich, and record daily the maximum pressure, and not merely the average daily velocity, so that a valuable collection of facts relating to the pressure of wind may be constantly accumulated.—*Universal Engineer.*

Deflection of Iron and Steel Rails.

In the *Comptes Rendus* of the Paris Society of Civil Engineers is a paper by M. Tresca, giving the results of some experiments on the deflection of iron and steel rails between the limits of elasticity and rupture. They show that, for these two metals of ordinary commercial character, the coefficient of elasticity is nearly the same, thus confirming certain special experiments in 1857 and 1859 upon Swedish iron, and cementation steel made from such iron. M. Tresca finds that the limit of elasticity for a given bar may be extended in proportion to the strain to which it had been previously submitted, and that the elastic limit may be pushed almost to the point of rupture without the coefficient of elasticity having varied in any perceptible degree. The metal, when it comes from the workshops, is in a state of instability, which disappears only by use; it becomes, by means of the actions to which it is successively submitted in its employment, more homogeneous and more elastic, but at the same time a little more flexible.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

Dish Washing Machine wanted one that is capable of washing 25,000 daily A liberal offer will be made any party possessing such a machine, by addressing D.W.M., Box 773, New York city.

Hotchkiss Improved Mechanical Boiler Cleaner. Removes all sediment from steam boilers, preventing incrustation. Send for circular J. F. Hotchkiss, 84 John St., N. Y.

Books relating to Civil Engineering, Electricity, Electric Light, Gas, Heat, Hydraulics, Mining, Sanitary Engineering, Steam Engine, Turning etc. Catalogues free. E. & F. N. Spon, 446 Broome St., New York.

The classic moralist bids "*Festina Lente*," but when you want a good pen, you canno get one of Esterbrook's too quickly.

A 4½ in. 2 Jaw Chuck, Independent or Universal, for Brass Finishers. Address A. F. Cushman, Hartford, Ct.

For Yale Mills and Engines, see page 109.

A. Young, Houston, Texas. Lumber and Mill Supplies. Intimate relations with thirty mills and one hundred yards. Articles of merit in machinery or builders' ware introduced.

Lightning Screw Plates and Labor-saving Tools, p. 108.

Glass Window Blind Slats.—This new invention, which consists in making the slats of glass, in different colors, is made by the Corning Glass Window Blind Company, of Corning, N. Y. These glass window blinds are not expensive, are a house decoration, elegant in appearance, and are an ornament to any apartment. Nothing equals them for convenience, usefulness, and beauty. The colored blinds effectually protect costly upholstery or delicate colors of tapestry from injury by sunlight. They give sufficient light for dining-rooms, and exclude flies.

A Man, with twenty years' experience in the Foundry and Machine business, wants something to do. Address F. J. Masten, Toledo, O.

Planers to face 2 x 4 inches; price $18. Box 170, Montclair, N. J.

For Sale.—No. 1 14 inch 6 roll 4 side (Schenck) Planer and Matcher. All late improvements, and never used. Also second-hand, 9 inch, 4 side (Huntington) Moulder, and 70 horse Upright Engine. Send for list of second-hand machinery in stock. Belcher & Bagnall, 40 Cortlandt St., New York.

Superintendent wanted, well skilled in use of woodworking machinery. Address Skill, Box 773, New York.

Rules for Engineers and Firemen, and the Removal of Scale in Boilers. Send for circular. Rankin & Co., 50 Federal St., Boston.

Alden Ore Crushers and Pulverizers, six sizes, $45 to $1,500. E. T. Copeland, 30 Cortlandt St., N. Y. city.

Saw Mill Machinery. Stearns Mfg. Co. See p. 77.

See Stockwell Screw and Machine Co.'s adv., p. 76.

For Best Quality Brass and Composition Castings, address E. Stebbins Mfg. Co., Brightwood, Mass.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 206, Jersey City, N. J.

Asbestos Board, Packing, Gaskets, Fibers, Asbestos Materials for Steam & Building Purposes Boiler & Pipe Covering, Asbestos Pat. Fiber Co., limited, 194 B'way, N.Y.

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Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Our new Stylographic Pen (just patented), having the duplex interchangeable point section, is the very latest improvement. The Stylographic Pen Co., Room 13, 189 Broadway, N. Y.

Advertising of all kinds in all American Newspapers. Special lists free. Address E. N. Freshman & Bros., Cincinnati, O.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 32 Dey St., N.Y.

Peck's Patent Drop Press. See adv., page 76.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

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Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 77

Blake "Lion and Eagle" Imp'd Crusher. See p. 77

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 93.

For Separators, Farm & Vertical Engines, see adv. p. 93.

For Patent Shapers and Planers, see ills. adv. p. 93

For Mill Mach'y & Mill Furnishing, see illus. adv p. 93.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 426, Pottsville, Pa. See p. 93.

Rollston Mac. Co.' Wood Working Mach'y ad. p 93.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville, N. J.

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The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

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For Superior Steam Heat. Appar., see adv., page 109.

Eagle Anvils, 10 cents per pound. Fully warranted.

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Walrus and Sea Lion Leather for Silver and all Metal Polishing. Greene, Tweed & Co., 118 Chambers St., N.Y.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 78.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg Steel Casting Company, Pittsburg, Pa.

New Economizer Portable Engine. See illus. adv. p. 109.

Blake's Belt Studs. The best and cheapest fastening for rubber and leather belts. Greene, Tweed & Co., N.Y.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 109. Totten & Co., Pittsburg.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) S. E. S. writes: I have a rowboat made of ¼ inch cedar, which I wish to make watertight. I thought of two ways: 1. To cover the outside with ⅛ inch boards and fasten with copper rivets; or 2. To cover with canvas, using some cement or glue. Which do you think is best, or do you know of a better method? I have tried calking, but it does no good. A. Use canvas, well painted.

(2) A. F. N. asks: 1. What length of stroke and diameter of cylinder will be necessary to run a bolt 18 feet long by 5 feet beam to run at a fair speed in still water? A. 3 inch cylinder by 4 inches stroke. 2. Where can I obtain rough castings for above engine? A. We do not know of any one having them in stock. 3. Can I use lap welded boiler tube for boiler? also, what diameter and length and number of flues? A. Yes; you should have 70 to 75 feet fire surface. 4. Which will be best, paddle wheels or screw? A. Screw.

(3) J. W. R. writes: 1. I have a boiler 8 feet long, 14 inches in diameter, with a return flue 6 inches. I want to know what is the heating surface. A. 26 feet. 2. My cylinder engine is 5 inches stroke, 3 inches bore; what is the horse power at 50 lb. steam, at 250 revolutions per minute? A. A little over 2 horse power.

(4) W. S. F. asks: Will an ordinary two inch spy glass objective do for a photographic camera? A. It might answer a purpose if the focus is not too long. However, a regular camera combination is better.

(5) W. E. asks (1) where to obtain statistics and plans for steam launches (engines, etc.) from 30 to 40 feet in length; their speeds and running expense. A. We know of no statistics or data respecting the performance of steam launches more full than you will find in the SCIENTIFIC AMERICAN SUPPLEMENTS. 2. Please tell me if the license for launch engineers has been changed A. The fee has not been changed.

(6) G. T. C. writes: We are using a solution here which has to be raised to a height of 20 feet, and it is almost impossible to get any kind of a pump to stand it, not even a rubber one Is a little heavier than water. Would it be possible to make a wooden tank strong enough to raise the solution by air pressure? If it would, about what thickness of material would be required? Could we use an air blower, or would it require an air pump to get the required pressure? A. A centrifugal pump of either iron or brass might suit your purpose, unless the material you pump will attack the metal. It would be possible to construct a wood vessel and use compressed air. You would require an air compressing pump a blower would not do. Could you not use a steam ejector?

(7) A. K. D. asks: Will a brick smokestack 55 feet high be sufficient height for a sixty horse steam boiler to produce the best results in raising steam, and what size hole should there be in the stack, and should it be smaller at the top than bottom? A. Make your chimney not less than 60 feet high and flue 28 inches or 30 inches square, and parallel the whole height.

(8) H. B. asks: 1. What size flywheel should I use for engine with 6 inch cylinder by 2½ diameter? A. 16 to 18 inches. 2. Can you give me any information on melting zinc? I have melted some, but it will not run solid. Is there any mixture I could put with it to make it run solid, and would it do for steam engine cylinder of the size above mentioned? A. You had better use block tin or brass for your cylinder. 3. Would block iron ¼ inch in thickness be strong enough to make boiler for cylinder mentioned, boiler to be 3 feet high and 1 foot 6 inches diameter. Would boiler be large enough? A. Would recommend three-sixteenths inch thick. Make boiler at least 20 inches diameter and 4 feet high.

(9) S. S. J. writes: In fitting key to crosshead and piston rod with usual taper, should it bear equally on each side, or should some be cut away to give draught? A. The sides of key should be parallel and a good easy fit. The draught to be on the edges and keyways cut away so that the rod will draw home.

(10) D. D. H. asks for the best method of putting in a non-conductor of heat between an iron roof and wooden ceiling. Will building paper answer the purpose? If so, how should it be used? A. The best method would be to give free circulation to the air between the roof and ceiling, then the heat from the roof would be carried away by the air.

(11) A. J. S. asks: Is there any way to keep the bright work, "hot bright work," such as ends and valve box of the Corliss engine, clean? A. A mixture of white lead and tallow, put on with a brush will keep the surfaces from rusting, but the cleaning must be done by hand.

(12) J. J. S. asks for some information relative to the source and method of preparation, etc., of what is known as a "snood," an article used by fishermen for attaching hooks to fishing lines. A. It is silk worm gut. The best comes from Spain. We believe it to be the contents of the silkworm's sac drawn out in bulk just as it is ready to spin its cocoon.

(13) D. H. F. asks: 1. What is the best material to make buttons of to prevent rusting on an electric switch that must necessarily be exposed to the weather? A. Copper. 2. Suppose I use a double electro-magnet with a permanently magnetized armature; the armature is attracted when the current passes. Reverse the current, thereby reversing the poles, will the armature be repulsed, and with what proportionate force? A. It will be repelled; the force will depend on the size of the armature and the amount of magnetism in it.

(14) F. D. H. asks: What is the "hall mark," spoken of in connection with London plate and jewelry? Of what does it consist, and what was its origin? A. Hall mark—the official stamp of the British Goldsmiths' Company and other authorized assay offices on gold and silver articles to guarantee their purity. The standard silver of England is an alloy, containing, in 1,000 parts, 925 parts silver and 75 copper. Originally the Goldsmiths' Company had a monopoly of gold and silver work in England. The company is still authorized to search the shops of silversmiths and seize articles which do not bear the hall mark of the company. A charge of 1s. 6d. an ounce is made for assaying and stamping, the larger portion of the revenue so derived being paid over to the government.

(15) J. H. T. writes: In SUPPLEMENT No. 225, p. 3589, under "Farming in Southwestern Minnesota" it is stated that: "Throughout these Western States lands are frequently pointed out as belonging to Englishmen, who to counterbalance the depreciation unfortunately going on in land property in England, are investing in desirable estates in America." Can this be true? I have always been under the impression that aliens could not hold real property in this country. Am I wrong in my impression? A. You are wrong. Different States have different laws on this point. 2. In both the SCIENTIFIC AMERICAN and SUPPLEMENT receipts frequently appear in which it is stated that so many parts of a solid and so many parts of a liquid are to be taken. By parts is it always meant parts by weight of both solid and liquid? If not, how then are such formulas to be interpreted? A. Parts by weight are intended unless otherwise specified. Fluids may often be more conveniently measured—taking the fluid ounce or liter and pure water as the standard. Their specific gravity must, however, be taken into consideration—sulphuric acid, for instance, is nearly twice as heavy as water (1·8). 3. Is it possible for a man engaged in active business, but who desires to employ such leisure time as he may have in the study of mineralogy, to obtain access to a cabinet of minerals in this city or vicinity? A. Visit "School of Mines," Columbia College, or Metropolitan Museum of Natural History, Manhattan Square, near Central Park, west side.

(16) J. G. S. writes: I am employed in a large engineering works in this country. Many of us have had quite a discussion on the question whether it takes more power to stop a fly wheel than it does to start it. Suppose an engine of certain power could get the speed of a fly wheel up in a minute, which is 300 revolutions, if the same, applied in the opposite direction, could it stop it in the same time? A. It would be stopped in less time. In starting you have the friction operating against the power, and in stopping the friction aids you.

COMMUNICATIONS RECEIVED.

On a Catamaran that will Come About. By J. B. C.

On the Theory of Scientists concerning Perpetual Motion.

On Artificial Diamonds. By N. B. C.

[OFFICIAL.]

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A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1836, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1836; but at increased cost, as the specifications not being printed, must be copied by hand.

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Chicago, 123 and 154 Lake St.
St. Louis, 29 North Third St.
St. Louis, 311 to 319 North Second St.
Cincinnati, 212 West Second St.
Indianapolis, Corner Maryland and Delaware Sts.
Louisville, 427 West Main St.
New Orleans, 3 Union St.
San Francisco, 2 and 4 California St.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

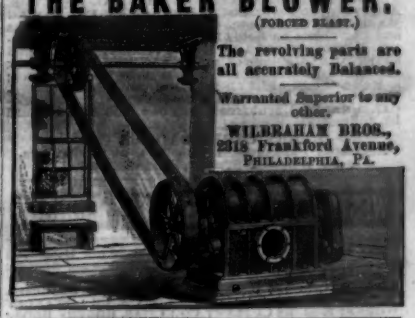
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

THE NEW YORK BELTING AND PACKING COMPANY
CAR & WAGON SPRINGS
Made by our processes are thoroughly efficient and practically indestructible.
37 & 38 PARK ROW, NEW YORK.

OPEN BACK PRESSES.
STILES & PARKER PRESS CO., Middletown, Ct.

THE BAKER BLOWER.
(FORCED BLAST.)



The revolving parts are all accurately Balanced.

Warranted Superior to any other.

WILBRAHAM BROS., 2318 Frankford Avenue, PHILADELPHIA, PA.

THE COST OF ADVERTISING

For any responsible advertiser, making application in good faith, we prepare and furnish a written estimate, showing the cost of any proposed advertising in the leading American newspapers.

We prepare and exhibit printed proofs of any proposed advertisement.

For preparing estimates no charge is made, and the applicant is placed under no obligation to transact his advertising business through us unless it appears to him that by doing so he will best advance his own interests.

A copy of the advertisement, a list of the papers, the space the advertisement is to occupy, and the time it is to appear, should be given with the application for an estimate of the cost.

When an advertiser does not know what he wants, or what he ought to do, he can designate some sum of money within which he wishes to limit his expenditure; this will enable us to prepare for him such a list of papers as will be the best for his purpose, within the limits which he prescribes.

Send 10c. for 100-page pamphlet.

GEO. P. ROWELL & CO.,

NEWSPAPER ADVERTISING BUREAU,
10 SPRUCE ST. (Printing House Square),
NEW YORK.

BROWN'S PAT. SPLIT Shafts, Hangers, PULLEYS

At low prices. Largest assortment. A. & F. BROWN, 57, 59, & 61 Lewis St., New York.

Mill Stones and Corn Mills.

We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.

J. T. NOYE & SONS, Buffalo, N. Y.

Pictet Artificial Ice Co., Limited,

P. O. Box 3083. 142 Greenwich St., New York.
Guaranteed to be the most *efficient* and *economical* of all existing Ice and Cold Air Machines.

BOILER COVERINGS.

Plastic Cement and Hair Felt, with or without the Patent "AIR SPACE" Method.

ASBESTOS MATERIALS.

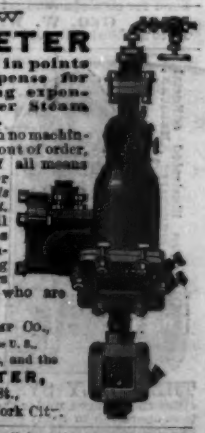
Made from pure Italian Asbestos, in fiber, mill board, and round packing. THE CHALMERS-SPENCE CO., 40 John Street, and Foot of E. 9th Street, New York.

THE NEW

PULSOMETER

Is more economical in points of original cost, expense for repairs and running expenses, than any other Steam Pump in the World.

Simple and compact, with no machinery whatever to oil, or get out of order, it stands at the head of all means of elevating water or other liquids by steam. *It needs no skilled labor to look after it.*



Send for book giving full description, reduced prices and many letters of commendation from leading manufacturers and others throughout the country who are using them

PULSOMETER STEAM PUMP CO., Sole Owners of Hall's Patents in the U. S., 131,313 to 131,543, both inclusive, and the NEW PULSOMETER, Office, No. 80 John St., P. O. Box No. 1536, New York City.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 50 Gold St. New York.